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Psychology of "Asia for Asians"

By K. S. INUI, LL.D.

THE writer is aware that he has selected a most tactless topic in these unusual times when he chose this subject, "Asia for Asians." But he also knows that open-minded readers would welcome a frank and open expression, right from the shoulder so-to-speak. In so doing he must first make clear that he represents no one but himself in thus treating this theme.

Recently "Asia Monroe Doctrine," "Asia for Asians," "Greater Asianism," "The New Orientalism" and "Pan-Asianism," are being widely and freely mentioned and discussed. Strange it may seem, none of these is original to Japan or even to Asia. They are only the Oriental counterparts of concepts already evolved in the Occident. If nationalism is a result of contacts of groups and agitated consciousness for self-preservation or promotion, so any idea mentioned above is a manifestation of nationalism or consciousness of larger groups for their common interest. It is not a legal concept any more than is the Monroe Doctrine. But it is a manifestation of group psychology. None of the above designations as yet possesses any definite outline, not even as clearly as does the Monroe Doctrine or Pan-Americanism.

When European nations defaulted their payments of the World War debts, they dubbed America "Uncle Shylock." Considerable sentiment was manifest among certain idealistic groups of people to resist the American economic superiority by uniting European economic forces under what they then termed "Pan-Europeanism." Such a movement was put forward strongly by Count Coudenhove of Austria. The same idealogy prompted the Ottawa Conference of 1932 to move for a closer economic collaboration within the British Empire. Subsequently the continentalism of Europe and America and universalism of the League of Nations manœuvred for their positions and eventually were about to be destined to become the Briand scheme within the orbit of the League. Simultaneously they began to visualize a similar picture for Asia. However, it was still a mirage that the Occidentals saw on the Far Eastern horizon.

A youthful American scholar once vigorously attacked Japanese actions in China and charged that they were outrageous. Dr. J. Shinobu, Professor of International Relations at Waseda University, replied by saying that the only difference between American action in the Carribean and Japanese action in the Far East is that Japan perhaps is more prescribed by treaties than is America, but psychologically both countries act and react essentially the same.

The analysis that follows in this article is not a legal discussion but is merely, as has already been pointed out, a description of the reflections in Oriental mirrors as viewed subjectively by Occidentals of their own fancied images under like circumstances. But, within the last few years, the people of the Orient, especially of Japan, are beginning to indulge in their own interpretation, oft-times in comparison with or in justification of their national position or international attitude.

(1) All these terms which are set out at the outset, with a vague outline of idealogy and attitudes are now in use in the East partly in assertion to obtain recognition for its existence as a distinct entity which has its own history, tradition and culture, even though it has been greatly influenced by the West, or, perhaps, because of the consciousness of such an influence. The idea that inspires Asian autonomy expects the West to appreciate its background or mode of thinking, even though it is not always parallel with that of the West. And the East holds that it is not necessarily wrong, ridiculous or mysterious, and has a place in the world history of culture and civilization.

(2) These terms, too, include a sense of remonstration to certain Western mentality, merely matter-of-fact or unconscious, though it may be, of applying the standards and precedents of the West to the things, customs, judgment of the East. The Orient admits that the Occident has been the cradle of modern science, art and institutions, and it has been greatly benefited and inspired by the West whose standard it has often even blindly accepted. The West, on its part, has expected the East to follow or copy it and has assumed unconsciously an attitude of its subjective importance, as exemplified by its designation, "Balboa's discovery" of the Pacific, whose shores had long been inhabited by peoples with history and culture two or three thousand years older than his.

Europe and America automatically expect the Far East to play its game according to their own rules and regulations. In the Davis Cup contest, for instance, a Japanese or Chinese will be compelled to travel either to Europe or America, and play at the location and on the kind of courts, whether hard or lawn, in the season and on the date they designate. But so long as this attitude of the West does not vitally challenge the very foundation or the existence of the East, it has raised no voice against its Western mentor, for Europe and America have long been the models of Japan and China. But when this attitude seriously requires readjustments of the Orient and its Orientalism, then it tends to transform halting acquiescence into resentment.

(3) This defensive psychosis became more pronounced when the East came suddenly face to face with an extension into the East of an improvised and not yet thoroughly tried international political system of the West. Japan, for instance, could not quite acquiesce when Geneva tried its yardstick, whittled by Washington, on the vital affairs of the Far East, whose history and traditions are so dissimilar to those of the West.

Europe, where more blood has been spilled and more nations have been made and unmade than in any other part of the world, has paid for the process dearly and reluctantly, and is now awkwardly attempting to employ, a system of collective peace through collective action. This new collective system in its short existence has worked out relatively well because it was inaugurated after the titanic sacrifices of the European nations. But as it was applied to the East it presented the appearance of the time-honored balance of Power or formula "controlling one barbarian by a set of barbarians," or a gigantic intervention or coercion.

(*a*) European nations are highly organized in their national life, in the relationships of peace as well as of war. There is one capital for each nation, which in turn has but one government, which speaks for its people. Here we have all the necessary prerequisites for international life with the existence of seats of authority for international responsibility.

In China, however, even the national government would not dare to remove one military chief 500 miles away from Nanking. The governors and their representatives of outer districts go to the Capital, not to pay homage, but to squeeze the small and limited pocket of the central exchequer. When the Panchan Lama went back to Tibet, he had to go by way of India over and across the highest mountain ranges of the world, though it must be admitted that Chiang Kia-shek came to exercise as near to a National control as any one man within the last quarter of a century.

Canton has its own pride and interests which it believed ran counter to those of Nanking—now of Chungking. In their joint pursuit of the Reds, when the Nanking troops were hard at work, the Kwangtung contingents merely waited and watched the process with its eyes glued on Nanking even more than on the Reds. When the politicians of the South hoped to effect an understanding with their northern brothers, they came north with an escort of an army or two. When the 19th Route Army, originally of Canton, was brought to Shanghai in 1932, for the purpose abovementioned and started to embarrass the Central Government by launching the "Shanghai War," Nanking, of course, returned Canton's compliments and watched it from the side line, until it became too uncomfortable, because, in the beginning, it was the affair of the 19th Route Army and not of Nanking.

Marshal Chang Hsueh-liang deemed it beneficial to be allied with Nanking, though his father, Chang Tso-lin, preferred to be independent of Canton, or even of Peking, which for a while he annexed under his control. Yen Hsi-shan cared little what was happening in the rest of China. He was happy in his preserve. But why enumerate any more examples? There has never been one within the republican regime of China who could stand up in the Capital and say, "I (or we) will be responsible, for better or worse, for all of China." The speeches of the Chinese diplomats at Geneva have always been school orations, not the will of a Government capable of translating their words into action.

The successive governments after Yuan Shih-kai all have failed to recognize his international commitments. No less authority than Quo Tai-chi, the Chinese Minister to London, now openly admits that the Peiping Government of the time of the Washington Conference was "a shadow Government whose authority did not run much beyond the city walls." How can we be sure that those who come five years hence, will not treat the present Nanking Government in the same fashion? No few people have called it "a fiction of a nation"—whose central Government ruled over only a few provinces in the Lower Yangtze, when the famous hasty resolutions were passed in Geneva in 1933 and again this year, though the area of its control is somewhat extended latterly.

(*b*) The West has never realized that in 1931 there was but one government in the Far East that was capable of speaking independently and with responsibility. That was in Tokyo. All others, with the exception of Siam, and partially of China, were under tutelage of absentee overlords in other climes. Russia, who is the mistress of Siberia, was not a part of the Geneva scheme until after Japan left it. And the mind of the Colony naturally works 8,000 miles away from it. The master of the Philippines, and the godfather of the League of Nations, belongs to the Western Hemisphere, and does not now even claim any blood relationship with it except when he sees fit to do so in the International Labor Office, and definitely refuses to be associated with the Hague Court. Java, Sumatra, Tonking, Annam, Gambodia and vast Siberia, and all have no will of their own, taking orders from their real rulers in distant parts of the globe.

(*c*) As we have already seen, European nations are not only more firmly centralized nationally but are better disciplined internationally. A marshal of an Occidental army would not attempt completely and systematically to uproot the treaty interests of a neighboring nation without consulting his national government. Nor would he remove his household to another part of the country, leaving his defeated soldiers disorganized and turning into bandits, to wage guerrilla warfare, not on enemies, but on their own countrymen.

Little did even the Japanese realize that in assaulting the Shenyan Arsenal and registering a telling blow on their potential foes, 200,000 henchmen of Marshal Chang Hsueh-liang could readily augment that huge bandit population in Manchuria against whom they had to engage in beastly combat. Japan might as well in the present campaign expect similar experiences with the remnants of North and Central China war-lords. This could never have happened in Europe. It became apparent to Japan in 1931-33 that neither Nanking nor Chang Hsueh-liang could regulate the behavior of the professional or amateur bandits. Japan alone saw the gravity of the situation. To her these things are questions of vital interest—which the West cannot understand.

What irritated public opinion in Japan in 1931-3 against the members, particularly the lesser members of the League, is the fact that they became so much subjectively interested in the Sino-Japanese controversies as to be unable to dissociate themselves from possible parallel cases in future in Europe between themselves and their powerful neighbors. When Japanese troops occupied a part of Manchuria, European capitals at once painted the very same picture within their own borders, failing to realize, however, that a Manchurian Incident could never take place in Europe in that particular way. There was no analogy between a smaller nation of Europe and its bigger neighbor on the one hand, and China and Japan on the other.

But in the China Incident of this year the position is somewhat reversed. It was the bigger Powers, particularly Great Britain, that took keen interest, due undoubtedly to her vast interests in central China. For the lesser Powers who were brought into the Nine Power Conference did not see fit even to vote on this occasion.

The situations in the two continents are not analogous at all, yet with hysterical agitation, Europe passed fervent and hasty resolutions each time. They were unable to see another side of the picture, for they had been accustomed to lay down the law for other parts of the world. Asia by Asians is partially, at any rate, a manifestation of the disappointment and resentment against this mentality of some of the Western peoples, particularly by the Japanese.

(4) Again, it is a challenge for re-examination of Western history and experiences. A nation is a body of humanity and it is extremely human for a person when he is accused or charged with something, to retaliate, "What about you?" or as a homely saying goes "what is sauce for the goose is sauce for the gander," and we forget that we all live in glass houses.

The United Press dispatch credits to Mr. Hamilton Fish, Member of Congress representing New York, the following fitting comment on western psychology. According to the United Press dispatch of January 6, 1933, he said:

> "It is hypocritical for Britain and France, who have grabbed half of the world, to tell Japan that she has no superior rights in Manchuria, and it is hypocritical for the United States to sit in moral judgment on Japan after we have seized the Panama Canal zone and while we continue maintaining the Monroe Doctrine."

Some, in Japan, resent the treatment of certain Japanese in Anglo-Saxon frontier countries, some of which hold dearly to the Monroe Doctrine, while others insist upon "White Australia," and none of whom is quite free from offensive, discriminatory legislation against Japanese or Chinese. Yet these very frontiersmen of a mighty civilization, who have enclosed one-third of the world's habitable area with high walls of tariff and against migration, are loudest in their claim for the "Open Door" and equality of opportunities in the only precious and one remaining corner still left for free access to the people of the Far East.

Japan has never felt that Manchuria would solve her population problem. But the unrelenting attitude of the Anglo-Saxon controlled communities towards Japanese immigration, and tariff and commercial discrimination has never ceased to be a source of irritation to Japan. She could not help casting envious and somewhat inquisitive eyes on these progressive and aggressive pioneers. When they came to the Far East with their unilateral doctrine of the "Open Door" to suit the newcomers, the Japanese reaction was not merely Oriental but human. The Orient realizes that there has been a revolutionary change in the peace organism of the world. But before a new scheme is invoked to the letter, only when it is convenient, the Orient challenges Europe and America for retrospection and re-examination of their past records and present demeanor in their own domains.

(5) The new doctrine also includes the determination by Japan not to repeat the sad experiences of being used as one butt of "barbarians to offset or be offset by another." The modern diplomatic history of Japan is merely the record of struggles in the balancing wheel of China against one or more European or American Powers. When Japan was about to receive the fruits of victory (it was then still considered a victor's unquestionable right) of the Sino-Japanese war of 1894-5, Russia instigated France and Germany to join her in the now famous triple interference ostensibly in favor of China. The Russo-Japanese war was fought because China was unable to drive the Russians out of her territory—so she balanced Japan against Siberia's master.

Japan's contribution in the World War was by no means insignificant. But China balanced the United States and Great Britain to cause Japan to give up Shantung. When the Manchurian Incident took place, she hastened to hold tight to the apron strings of the "League barbarians" to control the "Japanese barbarians." Now the same resourceful China is whistling loudly to make the "Nine Power barbarians" to engage in the China war-dance against Japan.

Japan, tired of being an eternal butt in the struggles in China, the most of which were of China's own making, is determined to put a stop, not to European and American collective peace systems, but to China's balancing method and collective intervention in the affairs upon which Japan's very existence depends. Japan contends that the first rule in international relations is direct contact either for co-operation or adjustment. The collective system is a marvellous scheme, but the world must be taught to crawl before it can walk, and should not jump to a second expedient at the sacrifice of the first and fundamental rule of international intercourse of direct contact and adjustment. Once again Europe, in the magic name of the collective peace system, is cast in the rôle of "barbarians" to offset the "Japanese barbarian." In the process it has stiffened China's back and fanned the flame of Japan's indignation for no visible good result.

(6) The new doctrine in Asia owes its inception to the apprehension that the Japanese entertain towards communism in the same way as did America towards the European monarchical system. When the United States considered that she was well enough established herself in her new home on a new continent she saw a danger in the Holy Alliance which declared among other things "that revolt is crime and that any pretended reform effected by revolt and open force was null and void and forbidden by the public laws of Europe."

The message of President Monroe to Congress of December 2, 1823, finds its origin in this defensive idea that the extension of the monarchical systems of Europe to the Western hemisphere would be dangerous to the new nation's peace and safety and "as a manifestation of an unfriendly disposition towards the United States."

If it were not for Japan's long historical background commending poise and dignity, and had she been nearly as enthusiastic and evangelistic as was America with her newly adopted political theory, Japan might have proclaimed her Monroe Doctrine in Asia. For to the Japanese, communism is no less real and dangerous than was the monarchical idea to America. It is not because Japan lacked a proper appreciation of the danger of Bolshevism, or of her place in Asia, but because of her knowledge of the psychological effect that the American declaration created upon the South American mind. Japan was unwilling to retrace in Asia the American experience of unwelcome reaction upon her neighbors by a similar pronouncement. She preferred, not the Monroe Doctrine, but a counterpart of Pan-Americanism in Asia toward which the Monroe Doctrine is now gradually evolving, in other words Japan aims at a joint partnership with China for Asiatic peace and stability.

But much to Japan's disappointment China has made revolution her creed and communism her partner. Here again Japan is greatly being benefited by America's own generous good neighbor policy. She seeks no territory in China but co-operation, repudiation of anti-Japanese movements and activities, economic co-operation for co-existence and co-prosperity, spiritual and cultural co-operation against that strange and dangerous and yet untried doctrine from the "direction of Urga": not against Russia but against communism.

Up to 1925 neither Sun Yat-sen nor Chiang Kai-shek made any headway with the revolutionary program. They had to enlist Russian assistance for their successes when Chiang Kai-shek launched his northern expedition from Canton in 1926. But when Chiang succeeded in his march to the Yangtze Valley and captured Shanghai, the prize of China's political contest, he parted company most unceremoniously and ungratefully with his partners. When he discovered a new affinity in the Chekiang industrialists and capitalists, he began to wage relentless warfare against communists.

He was vainly engaged in a most difficult task of suppressing communists and extending the territory under his control. But when boldly and unsuspectedly he went up to Sian, he was taken prisoner by one of his supposedly grateful and trusted lieutenants, who, however, was working hand in glove with communists. To such a traitor he was compelled to deposit a note which in effect says,

"I owe you my life and I promise to ally myself again with the communists and fight Japan."

But he was unwilling to launch hastily this suicidal campaign, so he summoned in July the intellectual leaders of the country to his summer capital in order that he might be able to prepare them for the cancellation of his impossible promissory note. It is for this reason the communists of North China staged the Lukoujiao Incident before it was too late. It was the same magical hand of the communists that pulled the first trigger in the Shanghai area. This explains the undeclared war in Asia to-day and unprovoked burning of Japanese mills in Tsingtao, a loss of $300,000,000.

(7) Finally "Asia for Asians" is a psychological manifestation in defence of its own culture, traditions and interests. The West had developed science, but not religions. The East has developed more sentiment and less logic. The former has taught the world the value of the individual, while the latter that of the family. The virtues of the West have developed in its contact with things or in its elementary human contact of pioneering, whereas those of the East are the results of permanently established human contact, though their circles are limited. Those of the former have expressed themselves horizontally in liberty, equality and fraternity while those of the latter vertically in loyalty, fidelity and piety. Each has much to learn from the other. But the East strongly insists on holding and developing its own and adopting the other's best—but of its own volition.

Under these circumstances Japan who considers herself the stablizing force in the Far East cannot bring herself to welcome any attitude of any nation or group of nations of the West to assume the rôle of a coercive judge in a dispute between the two eastern nations, while again China runs to Geneva without a word with Japan with whom she has the trouble and with whom she must live as a neighbor whether she likes it or not.

In the language of the American street Geneva "passed the buck" to the Nine Power contingents, who have failed to iron out the situation. Because they thought that they could settle the Far Eastern trouble in the Far West with their own formula without even going through that step of "free and frank communication" with Japan as stipulated in the treaty, but inviting the European neighbors little concerned with the Far Eastern affairs, without the knowledge of one of the principals of the dispute to whom the last invitation was issued! Asia, at least Japan, stands for Asia to work out its own destinies, including disputes until a higher and more universally and bilaterally workable formula is devised.

Antimony Shortage

The recent steep rise in the price of antimony by £5 to £93 a ton is the result of fears of shortage of that commodity arising from the Sino-Japanese conflict now raging round Shanghai. China is the leading producer and exporter of antimony and ores in the world. The appended table gives in metric tons the production of regulus, crude and oxide in terms of metal by leading countries during recent years.

	1931	*1932*	*1933*	*1934*	*1935*
China	10,104	12,468	13,800	15,548	17,700
Mexico	2,230	1,388	1,559	2,134	3,656
Bolivia	1,078	1,176	1,517	961	2,674
Czechoslovakia ..	513	480	1,090	928	Not available
Algeria	6	214	80	529	810
World Total ..	15,600	17,300	19,500	21,400	Not available

Other countries like France, Greece, Italy, Morocco, Turkey (Asia Minor), U.S.S.R., Chosen, Japan, the United States and Peru produces smaller tonnages of stibnite (Sb2 S3), the most important ore of antimony.

Antimony is an essential constituent of many alloys coming under four groups, namely, bearing metals, type metal, Britannia metal and hard lead. The demand for hard lead was stimulated to an extraordinary extent during the Great War as antimony is an essential constituent of the ordinary type of shrapnel bullet. Antimony "hardens" lead and prevents the bullets from losing their shape on the bursting of the shell. The oxides and sulphides of antimony are largely used as paints, in the vulcanizing of rubber, in enamelling, in the manufacture of matches and in pryotechnics.

Soviet Policy in the Far East

By *W. J. OUDENDYK, K.C.M.G.*

The distinguished author prepared this article for the information of the Chatham House Group that attended the Sixth Conference of the Institute of Pacific Relations in 1936. Mr. Oudendyk's knowledge of China ranges over the period, 1894-1931, during the last twelve years of which—from 1919-1931—he was Netherlands Minister in China. He served as Netherlands Minister in Persia from 1910 to 1913 and in Russia from 1917 to 1918. Through the latter part of his term in Russia, Mr. Oudendyk was in Charge of British interests, and in recognition of his services in this capacity he was made K.C.M.G.

* * *

SOVIET policy in the Far East falls into two entirely different periods, coinciding more or less with the general attitude adopted by the Bolshevik leaders towards the other European Powers. In the early days of their Revolution when Russia, battered by the misfortunes of a disastrous war, lay at their feet, when they could at last put into practice all their long-cherished schemes and dreams, and when they succeeded in moulding the Russian people in a way far exceeding their wildest expectations, they were filled with buoyant hopes of carrying everything before them, not only in the war-tired West, but also in far distant Asia. Class war would sweep Europe off its feet, and xenophobia, combined with inflated nationalism, would destroy Western domination, trade and influence in the East and dry up a very important source of European prosperity and power. "Bourgeois" resistance in Europe would be correspondingly weakened, while at the same time in the eastern lands also the way would be prepared for the destruction of the possessing classes.

Later, when they had suffered many disillusions, and after the Chinese police raid in the Russian buildings in Peking in 1927 had exposed the joint activities of the Communist International (Comintern) and the Soviet Government, Soviet policy underwent a remarkable change.

In the West a closer contact was sought and obtained with the European and American capitalistic or "bourgeois" countries. Admission was obtained into the League of Nations and treaties were concluded of non-aggression, and even of mutual assistance, with those capitalistic countries at whose perdition the Communist International of Moscow continues to labor with unrelenting zeal. In the East the open and official propaganda against the Western Powers ceased, to make room for efforts striving after more normal relations. Though there exists no doubt that the Red movement in China receives help from an underground organization related to the said Communist International with a branch in Shanghai, there is no clear proof that the Soviet officials accredited to China have any longer direct and personal connection with this movement, which constitutes such a disturbing factor in the life of the Chinese Republic. The official attitude has become more discreet and correct. In fact, the development of affairs in general has made the U.S.S.R. change from a vigorous and cheerful offensive to a careful though defiant defensive.

It must be conceded that when entering upon their far-reaching ambitious campaign in the Far East, the Bolshevik leaders had no schemes at the back of their minds which might be described as imperialistic in the sense of the policy pursued by the old Russian Government ever since the days of Peter the Great. In fact, in those early years of the Bolshevik Government the idea of nationality was still wholeheartedly considered as being hostile to their theories and to the development of their revolutionary schemes. The real issue for them was not between nations, but between classes. Only for tactical reasons did they stir up the national feelings in Oriental countries as a first step towards the realization of their bigger schemes.

In Japan, where for obvious reasons such tactics were unnecessary, they cultivated the "dangerous thoughts" as a direct weapon for the overthrow of the existing state of things and of the dynasty. Already in 1918, when I spoke to the heads of the Cheka in Petrograd, I found that they cherished great hopes of a speedy success of the Japanese agitators, with whom they were in very close and personal contact, and they confidently predicted quick and fundamental changes in the Land of the Rising Sun.

One of the first acts for the realization of the Soviets' plans in the East was the foundation in Moscow, with the aid of State funds, of a school for the "oppressed" Oriental peoples, where young men, principally from India, Central Asia, China, Japan and Java, are being initiated into the theories of Communism and taught history as seen from the Bolshevik angle, methods of successful propaganda and the preparation for revolution in their respective native countries.

In the atmosphere of the great expectations created by the first important Bolshevik successes a great "offensive" (the Bolsheviks always speak in military terms) was ventured in China, by which it was hoped to rally the entire Chinese nation around Moscow's red banner in a general onslaught against Western influence in the Pacific. A passionate appeal was launched from Moscow in Comrade Karakhan's Declarations of 1919 and 1920. The Allied Powers and Japan were accused of having behaved like robbers in China, and everything which the Tsarist Government had in its time "grabbed" there, was offered to be restored without indemnification, such as the Russian share in the Boxer Indemnity, the Chinese Eastern Railway, all mining and timber concessions, and the privilege of consular jurisdiction. The Declarations wound up by saying:

"If the Chinese people wants to be free and avoid the fate which the Allies in Versailles have prepared for it, namely to make China into a second Korea or India, then it must understand that in its struggle for liberty it has no other allies or brethren but the Russian peasants and workers with their Red Army."

The appeal had not the success expected. The Chinese were sceptical and did not trust these promises, and although the student generation fell to a great extent under the charm of Marxism and of the Moscow propaganda, the Government in Peking felt its way very cautiously. But by the time it finally entered into negotiations for the conclusion of a treaty with Soviet Russia in 1924, the latter's ideas had already veered round to a considerable extent towards a more nationalistic point of view of its foreign relations. Though it was yet far removed from imperialism, it was no longer prepared to give away for nothing the Chinese Eastern Railway, which it claimed to have been constructed with the means of Russia's toiling masses. Nor was it willing to renounce the Russian share in the Boxer Indemnity, without having a voice in the spending of this money. And finally, it wanted to conclude a commercial treaty on the basis of the principle of the most-favored-nation. Consular jurisdiction had to be relinquished; this, however, had already been lost in any case and without the slightest hope of recovery.

In the North of China the Soviets' revolutionary policy may therefore be said to have failed to produce the desired results, and relations with the Chinese Government in Peking had to be shaped along the lines of ordinary diplomacy.

Comrade Joffe, who was the Soviets' emissary in China before the arrival of Karachan, endeavored to persuade Dr. Sun Yat-sen, when the latter had been temporarily ousted from Canton in 1922 and was again seeking shelter in the foreign Concessions of Shanghai, to inaugurate a truly Marxist and Bolshevik policy as the guiding principles of the Kuomintang. In this he was successful, though only partly so. In the joint statement which they published as a result of their conversations it was said that "although the Soviet system and communism were not fit for China, as the necessary conditions therefor failed, yet Sun Yat-sen shared Joffe's views about the desirability of co-operation with Soviet Russia against world imperialism."

From now on we see in the South of China a very close co-operation between the Soviets and the Kuomintang, whose headquarters were in Canton. The Soviet emissary Borodin (Grusenberg) assisted in the businesslike reorganization of the Kuomintang itself and in the equipment of the Southern Army which meant to march against the North, where the Soviet Ambassador was accredited to the Peking Government. Soviet military advisers assisted the Southern commanders in their successful campaign to the Yangtze, which finally led to the capture of Peking and the disappearance of the Northern Government.

Meanwhile the official Soviet diplomacy, in spite of the widely heralded altruistic principles by which it claimed to be guided, had at that time a distinctly "imperialistic" tinge: Soviet troops were left in occupation of Outer Mongolia, and by the new railway agreement the concession was given directly into the hands of the Soviet Government, which thus obtained sovereign rights within Chinese territory. This situation was bound to lead, and in fact did lead, to endless friction and constant trouble.

In a hidden way at the same time, the Soviet Embassy and consulates carried on, directly and indirectly, a frenzied subversive propaganda of Marxist ideas coupled with a fervent appeal to Chinese anti-foreign feeling. Various Chinese war-lords and revolutionary associations received their assistance.

In Manchuria such work proved difficult. Chang Tso-lin's Government constituted a lasting obstacle to successful communist propaganda. Therefore the Soviets welcomed the rebellion of Kuo Sung-lin in 1925 against Chang. They firmly expected that Kuo, if victorious, would accept close collaboration with them on the same lines as Borodin had succeeded in establishing in Canton. Ivanov, the Soviet managing director of the Chinese Eastern Railway, consequently prevented reinforcements from being hurried by railway from Heilungkiang to help Chang Tso-lin to quell this rebellion. The rebellion, however, failed and Kuo was executed. This episode was one of the reasons why Chang had Ivanov arrested afterwards. It was fear of Japan that made the Soviets at that time abstain from opening hostilities against the Chang Tso-lin régime. They thought it preferable to try to improve their position in Manchuria by profiting by the difficulties which also beset the Japanese in their relations with the Chinese. The latter were busy developing their railway system in evident competition with the South Manchurian Railway and disregarding all Japanese protests. The Soviet Government approached the Japanese authorities with the object of establishing a common line of action in Manchuria against the Government of Mukden, but the Japanese Foreign Minister, Baron Shidehara, did not enter into such an awkward combination. This, coupled with the construction under Japanese auspices of the railway line from Taonan to Tsitsihar, which was considered by Soviet Russia as a strategical move against Russian interests, may be said to have started the Soviet-Japanese tension which in years to come was to increase in vehemence, and which is now one of the great world problems.

It must not be forgotten that the aims and objects of the Communist International, which is inextricably intermingled with the Soviet Government, are the conquest of the world—not in an imperialistic sense, but for the realization of communism. It is not territorial aggrandizement that they seek, nor mere protectorates or tribute; their aim is the destruction of the national existence of the peoples. Patriotism has to be suffocated by class hatred and the very soul of a nation has to be crushed. Therefore they wage their own kind of warfare the whole world over; the headquarters for its conduct are to be found in Moscow, where careful plans for every sector of the world-wide battlefield are being worked out in detail.

These truths dawned also on the minds of the Chinese Nationalist leaders in 1927, when Borodin began to assume a more arrogant attitude towards them and tried to dictate his will. So just at the time when his influence seemed to the outside world to be at its highest, after Hankow had been captured, General Chiang Kai-shih drew away from him; he and his friends realized in time that communism could only, and was meant to, split the Chinese nation into warring social classes, whereas they, as patriots, required the co-operation of all classes of the country in the carrying out of a national policy to make China strong against the outside world. They dispensed with the services of all their Soviet advisers and broke off their relations with Moscow.

The raid by the Chinese police in 1927 upon the former Russian barracks in Peking put the Chinese authorities in possession of documents laying bare the full scope and intentions of Moscow's activities in China, and this more than anything else opened Chinese eyes to the dangers of calling in the aid of Bolshevism in the struggle against foreign acquired interests or encroachments in China. It led, for the time being, to the breaking off of all diplomatic relations between China and the U.S.S.R.

The joint Sino-Soviet management of the Chinese Eastern Railway in Manchuria equally proved to be a failure. Instead of serving as a profitable starting-point for communistic propaganda in the Far East, it turned out to be a continual source of trouble, complications and disputes between the Soviet Government and the Manchurian authorities, disputes which at one time, in 1929, even led to hostilities and a Soviet military invasion.

The creation of Manchoukuo, in 1932, made the situation on the Railway wellnigh intolerable. Certain adventurous or enterprising elements in Japan were suspected in Moscow of harboring the intention to seize the Chinese Eastern Railway by force as a preliminary to a further advance against Soviet interests in the Far East, and finally against the whole of Eastern Siberia, the so-called Far Eastern Region. The Japanese as masters in Manchuria were accused of subjecting the railroad to various kinds of violence and oppression.

This alleged menace led the Soviet Government to take different measures of defence. More especially they enormously strengthened their military power in the Far East. At the same time, however, they came to the conviction that under these altered circumstances the Chinese Eastern Railway could only be regarded as a constant source of conflict between the U.S.S.R. and Japan, and consequently they sought a way out of their predicament by the sale of the railway on the lines already provided for in the Soviet-Chinese Agreement of 1924 and even earlier (in 1896).

This sale materialized in Tokyo in March 1935. The railway, which was said to have cost 450 million roubles (at two shillings per rouble), was sold to Manchoukuo at a price of 140 million yen (at tenpence per yen). It was stipulated that 46.7 million yen was to be paid in money, and 93.3 million yen in the form of consignments of goods by Japanese and Manchurian firms during the course of three years.

Naturally the conclusion of this transaction considerably eased the existing tension, which had meanwhile been gradually increasing between Soviet Russia and Japan, and removed at least one dangerous source of friction. But this great Bolshevik retreat, meaning the abandonment of the last remnant of Russia's enormous and costly imperialistic endeavor to conquer Manchuria and obtain ice-free harbors, was still not enough definitely to clear the political sky in these parts of the world.

The immediate and principal cause for the continuation of the Soviet-Japanese problems was the fact that under Soviet auspices a "Mongolian People's Republic" had been set up in Outer Mongolia. This was a clever move. In the Tsarist days Russia had constantly coveted these regions, especially after her defeat in Manchuria in 1904-1905; and immediately after the Chinese Revolution it had succeeded in establishing, in 1912, a kind of protectorate there. Subsequent events, and more especially the Revolution in Russia, quickly undid this work. The doings of the "Mad Baron" Ungern-Sternberg, and the evasion of bands of "White Russians" into Mongolia across the Siberian frontiers gave the Soviets the welcome opportunity of marching into the Land of the Lamas.

The presence of Soviet troops in Urga, who came there as deliverers and friends, made it possible to take up the old Tsarist idea, altered in accordance with the changed conditions in Russia. This time not conquest of territory was the underlying purpose but conquest of minds, not russification but bolshevization, not the opening of a military highway into China but of a spiritual path leading to the undermining of the Central Government, the depossessing of the possessing classes, the spreading of class warfare, the obliteration of capitalistic influences and the destruction of foreign trade. In all its aspects this bolshevistic enterprise in Outer Mongolia may be called worthy of its Soviet sponsors.

The Mongolian leaders were persuaded to accept and promulgate a new constitution drafted on Soviet lines. The new Republic considers itself independent of China. As a matter of fact, the Mongols of Outer Mongolia have claimed this independence ever since the Manchu dynasty disappeared from the Son of Heaven's throne in Peking. But the Chinese Republic still claims Outer Mongolia as part of her territories, and moreover Soviet Russia at the time of the conclusion of the Sino-Soviet Treaty of 1924 (in the same year in which the Soviet authorities induced the Mongolians to set up their Republic, and when the Soviet Army was still in Urga) declared in that treaty that she "recognizes that

Outer Mongolia is an integral part of the Republic of China and respects China's sovereignty therein."

To the various requests of the Chinese Government that the Soviet Russian troops be withdrawn from Urga, the Russian representative persistently replied that these troops were not in occupation of Mongolia, but that their presence was desired by the Mongolians themselves.

The Bolshevik interventionists eventually withdrew their armed forces when it was safe to do so, after the present Mongolian Army, on which the Republican régime depends, had, under their guidance and instruction been built up.

Under Soviet Russian advice the "Great Huruldan" or Soviet was set up in Ulan Bator, as the capital Urga was renamed, and a "forced socialist construction" was inaugurated. Transport was monopolized, private trading was prohibited. The power of the hereditary princes was abolished and the land belonging to the Lama monasteries was nationalized. The Lamas, though they are still there, are no longer so parasitic or so powerful as before, and in this respect a long-overdue and healthy reform was accomplished, from the point of view of lay and clergy alike.

The Mongolians, however, being principally nomads, found the process of collectivization inevitably abhorrent to them, and in 1932 a serious insurrection broke out, which only Soviet Russian help and a quick and sharp turn to the Right could quell. Not without much bloodshed. Some twenty thousand desperate Mongols managed to fly from their native land and escape past the frontier guards into Inner Mongolia and also towards their kinsmen in Manchoukuo. The Mongolian régime recognized its errors, and after 1932 moderated its course. In fact, it made a drastic retreat from the "socialist offensive." The monopolization of transport was given up; merchants were allowed to resume trading; and several of the collectivizations were abandoned. But the more important collectives, such as "Moncencop" (Mongolian Central Co-operative) and the "Gostormon" (State Mongolian Trading Co.), were kept in being; and the power of the "huruldans" or soviets remained unbroken. The pattern of Soviet Russia was retained, but the Mongolians were henceforth handled by their Bolshevik tutors with more tact and imagination. The people had to "grow into socialism" rather than be driven into it. Whether either method can succeed among these primitive people must, however, remain a question. At the same time, great efforts were made to unite Mongolian economic life more closely with that of the U.S.S.R.

In 1930 the real Soviet investment in Outer Mongolia was estimated at some twelve million roubles (of uncertain value); this has probably been doubled or trebled by now. It is, of course, after all, not a very considerable amount, but the possibilities for more investments were probably not extensive. Half the capital of the Mongolian State Bank has been supplied by the U.S.S.R. Motor roads have been built towards the frontiers, wireless communication established and developed, and according to some Japanese reports the construction of a railway has been begun between Ulan Bator (Urga) and Verkhneudinsk.

In addition to all this, a Mongolian Army has been organized, with the aid of Soviet Russian instructors, of about sixty thousand men, which is reputed to be well trained, well equipped and of strong and enduring physique. The air force is said to comprise more than three hundred planes, and is based on several modern aerodromes. The pilots are exclusively Soviet Russians. In February, 1936, after a visit to Moscow of the Mongolian Prime Minister, it was decided that the military forces and equipment would be largely increased, with more Russian instructors, and that a loan of 50,000,000 roubles would be made to the Government, while that part of the proceeds devoted to military purposes would be expended under the direction of the Soviet authorities.

Soviet Russia sees in Outer Mongolia not only a useful bridgehead for the advance of Bolshevism in Asia and the conversion of the masses of the Orient to the doctrines of Moscow, but she looks upon that country also as a potential mineral wealth, a market of some importance, and a valuable source of supply for wool, hides, furs and cattle. But at the present moment there are even more important reasons than all these why Soviet Russia must attach the greatest value to the continuation of the existing state of affairs in her Mongolian enterprise. Outer Mongolia is now primarily important to Soviet Russia because it protects the right wing of her Red Army in Eastern Siberia, and the railway communication between Irkutsk and Chita.

Things in the Far East have developed differently from what could have been foreseen when Urga was occupied by the Red troops in 1922. It was then expected that from a Bolshevized Outer Mongolia the Manchurian provinces could also be made into a profitable field of propaganda, together with Inner Mongolia and possibly Chihli (Hopei); especially after Chang Tso-lin had met his death near Mukden and the Kuomintang influence had been established there. But events took a different turn.

The creation of Manchoukuo under the guidance and tutelage of Japan in 1931-1932 altered the picture completely; and now Outer Mongolia is first and foremost considered by Soviet Russia to be an absolute necessity as a buffer State from where she could not and dare not retire.

Although it must not be imagined that the bulk of the Mongolian people greatly love the Soviet Russians, and although this buffer State is not a full-grown member of the U.S.S.R., the country is so entirely dominated by its foreign tutors, especially in its foreign relations, that to all intents and purposes it may be considered as forming part and parcel of the Union.

This, of course, hardly fits in with Japanese ideas about the future of Asia.

When General Araki was still Minister of War in Tokyo he made the memorable statement that

> "Mongolia must, at all events, be a territory belonging to the East, and it must be given peace and quiet. It cannot be left in the position where other countries spread their aggressive policies with respect to it. To leave Mongolia in its ambiguous position means to maintain a center of disorder in the East."

Here we come to the source of the present great anxiety in the Far East: the wish of Japan to do away with the Bolshevik influence in Outer Mongolia, and the intention of Soviet Russia to keep Japanese influence away from there at all costs, because of her fear of Japanese ulterior designs against Eastern Siberia.

Between the two is China. China still claims Outer Mongolia. Hers may well be a voice in the wilderness.

On March 1, 1936, Stalin said in an interview in Moscow to an American press representative that should Japan attack Outer Mongolia seeking to destroy its independence, the U.S.S.R. would have to assist it in the same way as they had done in 1921 (He significantly speaks here of "independence," in spite of the Sino-Soviet Treaty of 1924). He added that the Japanese Ambassador in Moscow had already been informed to that effect, and that a Japanese attempt to seize Ulan Bator (Urga) would make positive action necessary.

This statement foreshadowed the signing of a Protocol on March 15, published in Moscow on April 8, by which a verbal agreement of mutual assistance between the U.S.S.R. and the Mongolian People's Republic were replaced by a military alliance.

This Protocol contains the following articles, as published in *The Times*:

> Article I says that "in the event of a menace of attack upon the territory of the U.S.S.R. or the Mongolian People's Republic by a third State," the two Governments "undertake immediately to consider jointly the situation that has arisen and take all measures which should be necessary for the protection and security of their territories."
>
> Under Article II the Governments "undertake in the event of military attack upon one of the contracting parties to render each other every assistance including military assistance."
>
> Article III lays down that troops of either Power in the other's territory shall withdraw as soon as the emergency has ceased.

The Protocol will have effect for ten years.

The Government in Nanking lost no time in making a vigorous protest to the Soviet Union against this mutual assistance pact, claiming, not without reason, that it violates the Sino-Soviet Treaty of May 31, 1924, and declaring that in no circumstance can China recognize the pact or be bound by it in any way. As was to be expected, Moscow denied that any violation had taken place, but this denial merely shows to what extent the Soviet fears of Japanese aggressive designs have grown.

These fears, for that matter, were already made sufficiently evident to the world by the truly formidable armaments concentrated in Siberia. Ever since the end of 1935 important artillery and heavy tank units have been removed from the Leningard military district and White Russia to the Volga region, where now over 100,000 troops have been gathered, ready to be directed eastwards. More immediate reserves for the Far East are collected round Novosibirsk. Three principal army groups are stationed in the Soviet Far Eastern Region; one, estimated at 70,000, south of Lake Baikal near Outer Mongolia; a second along the River Amur between Blagoveshchensk and Habarovsk, with an estimated strength of 150,000, under the command of General Blücher; and a third, about 60,000 strong, in the Maritime Province commanded by General Fedko.

In a pamphlet issued on March 10, 1936 (the anniversary of the battle of Mukden), the Japanese War Office gives an estimate of the present strength of the Russian military forces in the Far East, as a warning to the Japanese nation, and mentions that at Vladivostok there are stationed about 100 super-heavy bombers, which in a few hours could attack the vital parts of Japan and return to their base of operation. Further, it says, there are along the frontier about 900 Soviet aeroplanes, over 800 tanks and 500 armored cars.

According to this pamphlet, Soviet Russia has spent about £93,000,000 since 1932 on the construction of defensive works at important parts of the Soviet-Manchoukuo border. These works are composed of small but strong forts 50 to 100 yards apart, and arranged in threefold or fourfold lines. Their number is between 5,000 and 6,000. From the strategical point of view these forts are not only important for defence, but also form powerful bases for operations. Finally it is said that the Soviet Government has stationed between 50 and 60 submarines at Vladivostok. "It is easy to understand," says the pamphlet, "that these armaments are directed against us."

So we see here the same things happening which have happened in almost every serious crisis, that two rival countries accuse each other of harboring aggressive designs. And when at the same time one frontier incident follows upon the other, often with bloody results, it needs no great prophetic power to foretell that, unless something extraordinary occurs, these two countries will sooner or later find that they have drifted into war. Each one will then blame the other for having been the aggressor.

These frontier incidents have been of frequent occurrence ever since January, 1935, when some Japanese-led Manchoukuo troops encountered a Mongolian patrol near Lake Buïr, west of the Barga district. The frontier line in this open steppe country is vague or non-existent, and the nomad Mongolian tribes have their interests and habitation as well in these parts of Manchoukuo as in Outer Mongolia. In fact, this Barga district lies west of the Hsingan mountains, which might be said to form Manchuria's natural western boundary. The political frontier, however, extends much farther west, so that strategically a salient, populated by Mongolians and belonging to Manchoukuo is formed towards Siberia and Outer Mongolia.

A Manchoukuo-Mongolian border conference was convened in the frontier town of Manchuli on June 3, 1935, with the object of endeavoring to fix a definite border line. It remained in session for about a month without accomplishing anything. The representative on the conference of the (Japanese) Kwantung Army presented on July 4 a set of proposals demanding on behalf of Manchoukuo the opening of diplomatic relations between Manchoukuo and the Mongolian People's Republic, the establishment of a Manchoukuo military mission in Ulan Bator (Urga) and the construction of a telegraph line between the two countries. On the advice of her Soviet counsellors, Outer Mongolia declined to entertain these demands, and the conference came to an end. The U.S.S.R. vetoed these wishes because she does not intend Outer Mongolia to have independent foreign relations, and undoubtedly she saw in them a Japanese effort to obtain a footing within Outer Mongolia, from where a consolidation might be effected of the interests of the Mongolians there with those of the Mongolians whose homes are in Manchoukuo. The vagueness of the boundary line between the two territories might facilitate this process, and the result might be the firm establishment of Japanese influence and power also in these parts along the Siberian frontier. This is exactly what the Soviet Government wants to prevent at all costs.

Did not Litvinov, the Soviet Commissary for Foreign Affairs, declare in December, 1933, that Japan directly threatened the U.S.S.R. frontiers with the object of seizing the Maritime Province and the whole of the Far Eastern Region? "In such a state of affairs," he added, "there is nothing left for the Soviet Government to do except to start strengthening the frontiers, transferring thereto the necessary forces, and taking other military measures. But while we are taking exclusively defensive measures, Japan, as is known, is feverishly preparing for war." This open accusation of Japan led to mutual incriminations which still go on intermittently.

Whether Litvinov's and Soviet Russia's estimate of Japan's aims are correct or not is difficult to say, but all their subsequent actions are certainly inspired by this apprehension.

As the military preparations in Siberia advanced, and as the Soviet diplomacy was increasingly successful in its protective measures in the West by the entrance into the League of Nations and by the conclusion of pacts and agreements by which some "bourgeois" Powers are used for protection against others, the Soviets began to feel themselves more secure in the East, and their leaders began to use boastful and even provocative language towards Japan. Molotov, Chairman of the Council of People's Commissars, went so far as to threaten Japan "with complete destruction in the event of war."

The "war-bogey" has from the very beginning of the Russian Revolution always been a favorite means of propaganda. The outside world was constantly represented to the Russian masses as ready to fly at the Soviets' throat and itching to destroy their communist paradise. Meanwhile this "war-bogey" has had as a result the relaxation of pressure upon the peasants, and many other material concessions had to be made to the population of the country, in view of the possibility that a testing time may some day come when the loyalty of the people and their interest in the communist régime would be subjected to a severe strain.

The Japanese Foreign Minister was not slow in replying to the Soviet accusations. On January 24, 1934, Mr. Hirota said in his statement in the Diet that it was

> "most surprising and regrettable that the attitude of the Soviet Union towards Japan seemed to have undergone a change, and that unwarranted criticisms were being broadcasted at home and abroad against Japan, which certainly was not setting up any new military establishments along the Manchoukuo-Soviet frontiers, Moscow propaganda notwithstanding."

On January 10, 1936, Comrade Molotov, in his yearly report to the Central Executive Committee of the U.S.S.R., declared that although the Agreement concerning the sale of the Chinese Eastern Railway had been concluded, yet the main question as to the relations between Japan and the U.S.S.R. remained unsolved. Japan continued to evade the proposal made years ago by the Soviet Government for the conclusion of a Soviet-Japanese non-aggression pact, and such behavior on the part of Japan could but arouse suspicion. On the other hand, he continued, the repeated attempts by the Japanese-Manchurian military detachments to violate the frontier had not ceased. Nearly six months had passed since the Soviet Ambassador to Japan, Yurenev, had handed to the Japanese authorities a draft project for Soviet-Japanese frontier committees which would have the duty of investigating and liquidating frontier incidents, but so far Japan had given no reply. "One thing is clear," he said, "the playing with fire along our Far Eastern borders has not ceased, and the Japanese military authorities are creeping towards our frontiers both directly and also across other territories."

The Japanese by the end of 1935 contrived to make themselves at home in the province of Chahar in Chinese Inner Mongolia, after this province had first declared itself "autonomous," and the Manchoukuo troops, together with Japanese soldiers, occupied several points in its eastern districts besides Kalgan. At the same time there were not only collisions on the borders of Outer Mongolia, but also on the borders of Manchoukuo and the Maritime Province and near Hunchun in the neighborhood of the Korean frontier. A very serious affray occurred in December, 1935, and again on January 30, 1936. This time the cause was a company of mutinous Manchoukuo soldiers who had crossed and were pursued into Soviet territory. On February 8 and 9, the clashes happened again on the Mongolian frontier, and differed from their predecessors only in scale. In March, the Soviet press once more reported a serious incident between Japanese and Soviet soldiers, which resulted in a number of killed and wounded on both sides in the region of Hunchun.

Each side accuses the other of armed trespass, and in the case of the clashes in the district of Lake Buïr both produce maps in support of their accusation. Whether the Mongolian clients of

Soviet Russia try to push their vague eastern frontier so near the North Manchurian Railway as to make the Japanese feel uncomfortable, or whether the Manchoukuo authorities with Japanese support attempt to establish the frontier line as far west as they would like to have it, remains an open question.

Japanese protests in Moscow and Soviet protests in Tokyo alternate with each other. The correspondent of *The Times* in Tokyo mentioned on September 6, 1935, that the Manchoukuo Government had lodged no fewer than 107 protests with the Soviet Government arising out of incidents on the frontier. The charges included shooting, scouting, kidnapping, aerial trespass, infringements of maritime rights, and other offences. On the other hand, the Soviet Ambassador in Tokyo protested in January last against eight cases of trespass by Japanese military aeroplanes.

On both sides the question has again been raised of forming a joint commission, but whereas the Manchoukuo Government, according to Mr. Hirota's statement in the Diet of January 21, 1936, insists upon clarifying first the obscure points in the border line, the Soviet Government maintains that this line is already sufficiently clearly defined, and that consequently, as Comrade Molotov stated, a joint commission should be used only for the settlement of the various incidents.*

The difficulty is therefore one of principle, and a solution will be hard to find. The idea ventured by the *Asahi* on February 16, 1936, of the conclusion of a short-term pact of non-aggression as a means of ending dangerous frontier incidents if Soviet Russia would withdraw her troops some distance from the border, is certainly not one that will appeal to the Government in Moscow. Moving their armed forces away from the heavily fortified frontier line, just at the moment when they begin to feel more secure, is the last thing they will be found willing to do.

A statement calculated to have a quieting effect also in Soviet Russia was made by Mr. Hirota on March 25, after becoming Prime Minister. To a group of foreign correspondents he gave the assurance that his pledge that there would be no war while he was Foreign Minister would also hold good while he was Prime Minister. The adjustment of the relations with China, Manchoukuo and Soviet Russia was the primary aim of Japan's continental policy.

Enough has been said about the frequent Japanese-Soviet clashes, which almost assume the character of a war of frontier posts, to show how much inflammable material has been piled up here. One can only hope that the magnitude of the risks which a real war would entail for either party may yet act as a sufficiently strong restraining influence until peaceful negotiations can bring a solution.

Another field of Soviet Russia's political and commercial activities during the last few years has been in Chinese Turkestan, or Sinkiang (New Dominion), as it is called in Chinese. This is another vast tract of land on which, even in the Tsarist times, the Russians have cast avid eyes as affording a gateway overland into the Middle Kingdom. Through the establishment of the Japanese in Manchuria and by their penetration into Inner Mongolia there is no longer a Russo-Chinese frontier, except in these far-distant regions of Sinkiang. Russian trade with China has always been principally overland; in the sea-borne trade of the Treaty Ports Russia has never shown great competitive capacities. So it seems natural that Soviet Russia should renew the old efforts to gain influence in these lands across her frontiers, which nominally form a part of China, but where openings can be found for Russian commercial penetration and, moreover, where the population, consisting of Turkis (70 per cent), Mongolians and Chinese Mohammedans, might now perhaps be brought under Soviet Bolshevizing influence.

Many Turki children are already being educated among their co-religionists of the same race in the free schools of Tashkent in Russian Turkestan; they will afterwards, so it is hoped, prove useful propagandists for communism in their native land. Whether these hopes will be fulfilled may, however, be seriously doubted. The reports which the inhabitants of Russian Turkestan carry to their friends across the border about their present-day life and the compulsory cultivation of cotton are not such as to make the Turkis of Sinkiang feel desirous of placing themselves voluntarily under a Soviet régime.

However that may be, the renewed Russian efforts to gain influence in Sinkiang have, it must be acknowledged, been crowned with considerable success. By cleverly making use of the anarchy and civil war which reigned in Sinkiang from the beginning of 1932 until the end of 1934, the Soviet authorities have been able to see their influence established in many fields.

The civil wars ended with a victory of elements which were friendly disposed towards Soviet Russia, or rather who had benefited from active Soviet help and assistance. A Chinese force retiring before the Japanese Army in Manchuria in 1931 and allowed to withdraw into Soviet Territory was enabled by Soviet assistance to enter into Sinkiang and occupy Urumchi, where the Manchurian General Shêng Shih-tsai joined them and set himself up as Governor. He maintained himself in 1934 against a Chinese Mohammedan beleaguering force also exclusively thanks to Soviet military help. He was then induced, in fact he may have found himself obliged, to take Soviet Russian advisers into his service, both military and civil, and thus the U.S.S.R. established its influence there in an unobtrusive way and without the outside world taking much notice of it. General Shêng, however, is careful to make it known that he considers himself to be under the authority of the Chinese Government in Nanking, whose instructions he endeavors to carry out as much as is possible; and it would probably be rash to assume that he considers himself a simple tool in the hands of his Soviet counsellors, or that he would willingly join the Union of his protectors. It may safely be predicted that sooner or later a tug-of-war must take place between the protectors and their *protégés*.

Also in Kashgar the Soviet agents have been playing a highly successful game. By some means or another they have succeeded in inducing the commander of the Chinese Mohammedan troops, General Ma Chung-ying, after he had withdrawn from Urumchi to Kashgaria, to visit Soviet territory. There he still remains, apparently in voluntary exile, but to all intents and purposes as a hostage in Soviet hands for the good behavior of his rebel army, which is now commanded by his half-brother.

It is thus seen that the U.S.S.R. has first through the Governor Shêng Shih-tsai obtained political control throughout the greater part of Sinkiang, and thereupon acquired a checking influence over the powerful army of Chinese Mohammedan fighters who opposed Shêng. Ma Chung-ying, who now seems to hold an honorary commission in the Soviet Army, can come back to his troops whenever the U.S.S.R. wants him to, and whenever it suits the Soviet's interests that a renewed Mohammedan revolt, such as has ravaged Sinkiang so many times in history, should break out once more.

Meanwhile the Russians have embarked upon the same old game of using their power to obstruct British interests and trade which has been played so often in bygone days, when imperialist Russian schemes clashed with vested British interests. This game always seems to give a never-failing satisfaction to the Russian mind. It always has, and evidently still does, afford great pleasure to them to do as much damage to others as possible, even though this does not benefit themselves. It gives a sense of power.

So we now see how, at the instigation of the Soviet Russian advisers, every possible obstacle is put in the way of the Indian traders who enter Sinkiang struggling over the passes of the Karakoram, importing such luxury goods as velvets, muslins and cloth, which Soviet Russia is unable to supply.

Soviet Russia already entirely dominates Sinkiang economically, and her cheap goods flood the markets and bazaars, defying all competition. Her imports consist principally of cloth, printed cottons, china-ware, sugar, sweets, scents, cigarettes, matches and cheap enamel-ware. She has the advantage of railway communication almost to the frontier. The Turksib Railway, which was constructed in 1931, greatly increased these advantages. A journey from Moscow to Kashgar now takes only a fortnight. A number of motor roads have been constructed across the frontier into Sinkiang territory. There are, however, no indications that any plans exist for military conquest, nor does it seem likely that the present régime in Russia should be seeking territorial conquest here in the old imperialistic fashion.

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*A message from Tokyo dated April 28, states that on the previous day the Soviet Ambassador had informed Mr. Arita, the Japanese Foreign Minister, that Moscow accepted the Japanese suggestions regarding two joint commissions to be created, one to investigate and adjudicate disputes, the other to examine and, where necessary, to redemarcate, the Manchoukuo frontier from Lake Hanka to the Korean border.

The Japanese Government still maintains that disputes on the border between Manchoukuo and Outer Mongolia are a matter for those countries.

Having considered Soviet policy in China, Manchuria, Mongolia and Turkestan, it now remains to cast a glance at Eastern Siberia and to see what Soviet Russia is doing in her own dominions in the Far East.

Generally speaking, Soviet Russia's policy is dominated by fear. In the West she fears Germany, in the East she is afraid of Japan. It is therefore not reassuring for her to hear the spokesman of the (Japanese) Kwantung Army say, according to a Reuter telegram that he wanted to warn the U.S.S.R. to remember that "two powerful nations will form the opposition to the Soviets' military ambitions—Japan and Germany."

To such notions Moscow replies by feverish activities "on the internal and on the external front," by which is understood the development of the industrial and agricultural resources of the country, and the increase of the army, the fortification of the frontiers, the conclusion of non-aggression pacts and of the Franco-Soviet Alliance.

For the economic development of the Far Eastern Region, comprising that part of Soviet Russia which lies between Lake Baikal and the Pacific Ocean and the northern half of Sakhalin, a series of measures and new enterprises was proposed in the First Five Years Plan of 1928, and thereupon (as very little had been achieved under that Plan) again in 1933, under the Second Five Years Plan. The Soviet Far Eastern Region is a land of great potential wealth. Through lack of settlers, however, it is up to now but poorly developed. It does not even supply sufficient foodstuffs to nourish its sparse population. In 1932 the grain production supplied only one-third of the consumption, and only one-tenth of the meat consumed was produced locally. Wheat has to be imported from Europe and from Manchuria; meat, dairy produce, fodder, beans and poultry all come from Manchuria. In view of the backwardness of the country, the importation of a number of foodstuffs and also of some manufactured goods has to be permitted duty-free. A few industries have been established, mainly near Vladivostok and Habarovsk, i.e., flour-milling, distilling, leather, sugar and cement.

Fisheries form a very important industry. There is a great abundance of fish along the Russian Pacific coast, which for years has been left unexploited by the Russians. The Japanese fishermen, on the other hand, used to find here a profitable though illegal field for their activities. This question was settled by the Peace Treaty of Portsmouth of 1905, although it was only by the Fisheries Convention of 1907 that the different areas were defined for Japanese enterprise and the conditions were laid down on which the Japanese fishing industry could henceforth develop. This Convention lapsed in 1919, but it was not until 1928 that a new one took its place.

During the revolutionary period and the Japanese occupation of Eastern Siberia after the War, the Japanese interests were able, between 1917 and 1923, to install themselves more firmly than before in the Russian fishing-grounds, and millions of yen were invested there. But after the conclusion of the Fisheries Convention of 1928, Soviet competition became more and more formidable, and the Russians, who had received their instruction from the Japanese skilled experts and had been buying all their equipment, boats, etc., from Japan, employing many thousands of Japanese fishermen, gradually succeeded in establishing the industry on a national basis. Especially after 1930, Russian labor and equipment and supplies, such as for the canning of fish, have replaced the Japanese. At the same time, more and more of the fishing-grounds are taken up by the Soviets at the annual auctions in Vladivostok.

Although the fishery results have not reached anything like the level demanded by the First Five Years Plan, it is evident that the U.S.S.R. is determined to oust the Japanese from its own coast, and thereby also put an end to the troubles which so frequently occur here between the two countries.

The First Five Years Plan contained, among other ambitious schemes, the settlement in the Far Eastern Region of no fewer than 780,000 colonists before 1932. This scheme failed so to speak completely, and of the other schemes practically nothing, or at the most very little, ever materialized. Lack of labor was the principal cause.

A cement factory was built at Spask, and a sugar factory was erected near Habarovsk. The construction of a cracking plant in Vladivostok was started to be ready this year, which will be the only one in the Far East, and which will considerably influence the oil trade, as Sakhalin oil will thus be made available for the industries which are to be developed in the Far Eastern Region, and the costly transport of oil and oil products by rail from Transcaucasia will consequently be avoided.

The failure of the First Five Years Plan was acknowledged in Soviet circles. At the end of 1931 the Soviet journal *Sovietskaya Aziya* (quoted by Violet Conolly in *Soviet Trade from the Pacific to the Levant*) said:

> "The Five Years Plan is far from being fulfilled in the Far East. Party orders are not carried out, and so the ideal of the Far Eastern Province as an industrialized export base for the Russian Far East is still a complicated dream for a hypothetical future."

As the sovietization of the Far Eastern Region has been carried out in a much slower and more gradual way than in Russia proper, so also has the putting into operation of the Five Years Plan been accompanied by much less terrible stress and suffering. The inhabitants are on the whole more independent and more self-asserting than the "muzhiks" west of the Urals.

Somewhat better results are expected from the Second Five Years Plan, which was started in 1933. The same project is worked out as before for the creation of a large metallurgical industry using the mineral resources of the country, and thus making the Far Eastern Region into an independent industrial area. Though theoretically possible, the realization of this plan will require gigantic efforts, great abundance of skilled labor and almost unlimited financial means. It remains an open question whether in the near future such a combination of the necessary factors for success can be produced.

The construction of a second sugar factory was started in 1935. It is hoped to make the Region independent of sugar imports from Japan and Java. Again it is proposed to settle more than 700,000 colonists in the Far Eastern Region. But though special inducements are held out to encourage the peasants of European Russia to emigrate, and though release from certain taxes and from grain and rice deliveries has been promised, the results remain as little satisfactory as before.

A harbor is to be constructed in North Sakhalin for the benefit of coal and oil exploitation in the part of the island which belongs to Soviet Russia. The pioneers of the oil industry there were the Japanese, and it was with their technical and financial assistance that the Russians, who started boring in 1928, were able to obtain a considerable measure of success, which they hope to increase under the Second Five Years Plan.

On the whole, it is difficult to ascertain exactly in how far the results of this Five Years Plan have come up to expectations. It would appear, however, that more energy has been applied than in the case of its predecessor, and that something more will in consequence be achieved. Especially will this be the case in the matter of road and railway construction. The political events of the last few years have compelled the Soviet Government to enormous military efforts, of which railway construction naturally forms an important part. The lines of the Amur and Ussuri Railways are to be double-tracked along a distance of 2,883 kilometers, a work which has been started for some time, and which it is hoped will in some measure compensate for the loss by sale of the Chinese Eastern Railway. It is estimated that the cost of this work will be greater than the sum received for the Chinese Eastern Railway.

Furthermore, a great scheme has been conceived for the construction of a railway of some 1,400 kilometers in length, starting from Lake Baikal, through mountains and forests, to the mouth of the River Amur. The work on this line was started in 1932. It begins at Taishet on the Trans-Siberian railway east of Krasnoyarsk, and proceeds to the north side of Lake Baikal; from there it goes to a place called Tinda, and then to Komsomolsk, a new town of 20,000 inhabitants on the River Amur. For the present the plans only comprise the work between Taishet and the River Angara in the west and between Tinda and Komsomolsk in the east. It is estimated that the execution of the whole work will take from ten to twelve years. It is more than likely that these railway works are being executed by forced labor or "labor of prisoners," that is of people who did not fit in in the

(Continued on page 445)

Resources of North China

Unless Japan Extends Liberal Assistance, Development is Impossible

By LT.-COLONEL SUMIHISA IKEDA, of the Planning Board of the Japanese Cabinet

Translated from the Chuo Koron for The Japan Times

BEING virtually in a state of isolation from the rest of the world since the Manchurian Incident of 1931, Japan entertains no large hope, if any, of depending upon foreign supply of war materials in time of emergency and is confronted with the burning question of making the best use of the natural resources available in her own territory and Manchoukuo. In this respect, North China is a promising source of such resources as are needed badly by Japan at the present moment. But unless Japan extends liberal assistance to this region, the development there of its enormous wealth of nature is hardly possible. And along with this, the emancipation of the natives from the yoke of war-lords, which is a prerequisite for the realization of the principle of Japan-Manchoukuo-North China co-existence and co-prosperity, would be impossible of attainment. But it cannot be emphasized too strongly that such a program on the part of Japan does not aim at colonizing this part of China to her own advantage.

Iron is the most important of the natural resources from the standpoint of national defence. Iron ore deposits in all China are estimated at 200 or 300 million metric tons, of which half are credited to North China. Of the latter potentiality, Chahar Province is considered the richest with 66 per cent. Hopei Province is next with 24 per cent and Shantung the remaining 10 per cent for North China. In fact, such a large treasure still remains almost untapped.

Largest in China

The Lungyen iron mine in Chahar Province is the largest in all China with about 900,000 metric tons of exploitable deposits. Its ore product is of a superior quality, containing 52 per cent of iron and 0.12 per cent of phosphorus but no sulphur and other impurities.

The mine is owned by the Lungyen Iron Mining Company which was founded with capitalization of 5,000,000 yuan by the Chinese Government and private interests taking advantage of the military boom during the World War. The firm built a railway line from Suanhua to its mine and started the construction of an iron foundry equipped with a 250-ton blast furnace at Shihchingshan, west of Peking, with the object of producing 80,000 tons of pig iron a year. When the construction works were almost on the verge of completion, the aforementioned war was brought to an end, and there followed a sudden reaction upon business circles. And the projected furnace still remains unkindled and exposed to the elements. Inspection of metallurgical experts, however, shows that the iron parts of the plants have not yet corroded so considerably, and that if some improvements are effected in the existing equipment, plus the construction of some new ones, the old factories may well be put into operation.

Such reconstruction of the Shihchingshan foundry, however, is insufficient to operate the iron manufacturing industry there on a paying basis inasmuch as the production cost is very high in such a small enterprise. On the other hand, it is also unprofitable to ship iron ores to Japan. Thus, the only alternative left is to establish a large foundry with pig iron capacity of at least 600,000 tons a year. It is also most advisable to select the site for this establishment in the Tientsin district, where lime can easily be supplied from Mentowkow, and coal from Kailang or Chinghsing, and where by-products can be utilized by other industries, and where transportation facilities are comparatively complete.

It is more to the advantage of the establishment to have the new foundry employ a one-heat process and thus produce steel as well. Speaking from the economic standpoint alone, it would be better to discard the plants at Shichingshan, but from political consideration, the writer dares to say that it may be wise to operate them as a branch of the proposed large foundry. In order to transport iron ores from Suanhua on the Peking-Suiyuan Railway, it is necessary to reconstruct a line between Nankow and Pataling. This would eliminate the steep grade of 3.3/100 and increase the loading capacity of the line.

Huge Deposits

In East Hopei, iron ores are available is Lwan-hsien, Linyu, Funing and some other places, and their deposits are estimated at approximately 30 million tons. In Shantung Province, the Kinlingchen Iron Mine is the richest. It produces mostly aureole with the iron content of 62 or 63 per cent. Although the mine is owned by the Lu-ta Company under Sino-Japanese joint management and is said to have the potentiality of 14 million metric tons, it has not yet been mined. Although iron ores in Shansi Province are estimated at 30 million metric tons, they are deposited too deeply in the earth for exploitation to the fullest extent. At present, only one Chinese firm is in operation at Yangchuan, producing 10,000 tons of ore and 5,000 tons of pig iron.

The salt output in China, including rock salt and that available from wells in Szechuen and Yunnan Provinces and from lakes in Shansi, Kansu and Kokonor, is estimated at 35 million piculs, of which some 30 per cent is produced in North China. Of the total production in the north, four million piculs come from Hopei Province, two million piculs from Hotung district and five million piculs from Shantung. The development of this industry in this region has been much retarded by the export ban imposed by the Nanking Government on all products with some exceptions as well as by the heavy burden of taxes levied from complicated regulations.

By virtue of an agreement concluded in connection with the transfer of Shantung Peninsula to China, Japan is franchised to import salt from Shantung from 100,000,000 to 350,000,000 kin (one kin is 0.6 kg.).

In the Changlu district, the capacity is estimated at 700,000 metric tons a year, but the actual output ranges from 350,000 to 400,000 tons. Inasmuch as weather conditions and geographical environments are considerably favorable for salt making, it is considered an easy task to open new fields and thus to increase the output to one million tons. Previously shipments of Changlu salt too had been prohibited, but the former Hopei-Chahar Political Council reached an understanding with Japan to license exports of salt up to 70,000 tons for 1936 and 230,000 tons for 1937.

While the demand for industrial salt has been on the rapid increase in Japan reflecting the recent development of soda and other chemical industries it is urgently necessary for the Japanese to invest more money in the salt industry in North China with a view to increasing the output there and augmenting their purchases.

No Reliable Figures

Coal is another natural resource available abundantly in China, especially in the northern provinces. Although no reliable figures are at hand to show the total deposits in the country, from 50 to 70 per cent is believed to be in North China. According to the estimates made by the Industry Ministry of the Nanking Government, China's deposits total 243,600 million metric tons, of which 132,500 million tons, or 54.48 per cent, are in the north. Due to the heavy tax, high transportation expenses and unimproved management methods, however, the output in North China does not exceed 15 million tons a year, yet comprising 70 per cent of the country's total. Details classified by provinces are as follows: (In 1,000,000 metric tons).

	Deposits	*Output*
Shansi	127,000	3.00
Hopei	3,000	8.00
Shantung	1,600	3.50
Chahar	500	.15
Suiyuan	400	.09
Total	132,500	14.74

Hopei Province produces 8,000,000 metric tons of coal, or more than 40 per cent of North China's total. The Kailan Mine, operated under Sino-British joint management, commands 700 million tons of deposits and produces 5,000 tons a year. It is the largest coal mine in China. Its output is supplied, for the most part, to Shanghai and other cities along the Yangtze valley and the Kwantung area. Being suitable for coking, bituminous coal from this mine is indispensable for the iron industry of Japan and is annually imported by her up to the extent of 600,000 or 700,000 metric tons.

The Chinghsing Mine is another rich source of coking bituminous coal. The output is estimated at 800,000 tons a year and is consumed mostly in the Peking-Tientsin district. Although it is hardly possible to ship this coal to Japan due to high transportation expenses, the eventual opening of railway service between Shihchiachwang and Tientsin will make possible Japanese purchases. Further, this mine will be an important supplier of coking coal in case the aforementioned iron foundry is actually established. It has been operated under Sino-German control but is likely to be transferred to a Sino-Japanese administration.

Owned by Chinese

Besides, there are several coal pits at Chengfeng near Chinghsing, at Liukiang and Changcheng near Shanhaikwan, and at Mentowkow. The Chengfeng Mine is owned by Chinese interests and produces from 300,000 to 400,000 tons annually. The Liukiang Mine has been bought by the Kailan Mining Administration. The Changcheng Mine with an annual capacity of some 400,000 tons will be operated under joint management of the Chinese interests and the Oriental Development Company.

There are three large coal mines in Shantung Province, namely, Tzechwan, Poshan and Chunghsing. The first two, situated on the Shantung Railway, are operated jointly by Chinese and Japanese interests, producing 700,000 and 80,000 tons respectively. The Chunghsing Mine is in Yi-hsien in the south and is under Chinese management. The output is 1,500,000 tons a year and of good quality. It supplies coking coal to the Nippon Steel Tubing Company, but the bulk of its output is shipped to the south.

In Shansi Province are some 15,000 coal mines, their total deposits comprising half of China's total. Due to the lack of transportation facilities and other inconveniences, only two of them are actually in operation and producing no more than 3,000,000 tons. Both anthracite and bituminous coal available in this region are of superior quality.

North China will play another important rôle as a source of raw cotton for Japan. China is the third largest producer of this item, her output comprising 16 per cent of the world's total. And half of this production is supplied in the north along the Yellow River and in the south along the Yangtze valley. The production cost of Chinese cotton is lower than American cotton, approximately a 20 per cent differential. The only drawback is that its quality is not so good. But the cotton breed has been gradually improved of late, and as a matter of fact are approaching some American stocks. Japan's cotton consumption, which has been increasing annually by 30,000,000 kin in the past few years, totals 1,200 million kin a year, of which only three per cent is supplied from China, while 72 and 21 per cent come respectively from the United States and British India. If the nation should attempt to attain self-sufficiency in this article, there is no alternative but to increase the cotton output in North China.

Annual Production

The annual production in North China is from 3,500,000 to 3,600,000 piculs, of which more than 2,000,000 piculs are of American breed. And of the total, 2,000,000 piculs are consumed by cotton spinning companies and another 1,000,000 piculs are shipped to other parts of China and to Japan, but it is used mostly for wadding and medical purposes and not for spinning.

Land under cultivation in Hopei, Shantung and Shansi is estimated at 280 million ho (a Chinese unit corresponding to about 7.92 acres), of which 15 million ho, or only five per cent, is devoted to cotton growing. It is therefore not difficult to treble the cotton acreage and thus to increase the cotton output from 3.5 to 10 million piculs. Still better, the encouragement of cotton growing is something akin to killing two birds with one stone, for it is not only contributing to securing the supply of cotton to the Japanese nation but to the rehabilitation of impoverished peasants in North China.

North China can also supply wool to Japan. The output there totals approximately 140,000 piculs a year, of which 38,000 piculs are produced in Hopei, 64,000 piculs in Suiyuan and Chahar, 20,000 piculs in Shantung, and 15,000 piculs in Shansi. Wool exports from this region aggregate annually more than 10 million yuan, the bulk of them being shipped from Tientsin to the United States. Lacking in elasticity and lustre, Chinese wool is generally used for carpets, mixed cashmere and rugs. However, it is necessary for Japan to utilize as much Chinese wool as possible.

In line with the development of various industries in North China, transportation and communication facilities must be improved and expanded. Electric power especially must be supplied profusely at a cheap price. In the field of railway service, it is urgently necessary to construct two new lines, one between Shihchiachwang and Tientsin, and the other between Chengteh in Jehol and Tungchow in East Hopei. Chinghsing coal and those resources available in Shansi will be transported by the Shihchiachwang-Tientsin Railway to Tientsin and thence to Japan. And the other projected line will be instrumental for the consolidation of economic relations between Manchoukuo and North China. Moreover, the Tsingtao-Tsinan Railway must be extended to Taokowchen on the Peking-Hankow Railway.

The roads in North China are in too poor conditions for automobile traffic. Construction of roads has been making progress more or less in some parts of Shantung Province, but in other districts there are few public highways worthy of the name. Efforts will be made to improve existing roads for automobiles.

Harbor facilities, too, are far from being satisfactory, the anchoring capacity of the Paiho estuary, including Tangku and Tientsin, being not more than 3,000,000 tons a year. Steamers coming to these shores are, for the most part, of less than 2,000 tons, and Tientsin's trade volume, despite its large hinterland, is only one-fifth of Shanghai's. This is due largely to its unimproved anchorage equipment. The capacity of Tangku and Tientsin harbors must be expanded at least to 7.5 million tons. or 5.5 million tons for the former and two million tons for the latter. Facilities must be installed to accommodate steamers of more than 10,000 tons.

In the field of electric power industry, a number of small firms are operating disorderly, and fees they charge for power supply are too expensive to facilitate rapid development of manufacturing industries. Such being the case, the Kochu Koshi (China Development Company) founded the Tientsin Electric Power Company through co-operation with Chinese interests, and its two thermal power stations of 15,000 kilowatts, now under construction, will be put into operation by the end of the current year. In order to invest in this firm, the Electric Power Association of Japan established the North China Electric Power Development Company, a holding company capitalized at Y.5,000,000.

Far From Satisfactory

The Tientsin Electric Power Company will not confine its activity to the Tientsin district but will control the power industry all over North China with a view to supplying electric power profusely at a cheap price to all industries to be developed there. Potential water resources, estimated at 120,000 kilowatts for the Yungting River and 200,000 kilowatts for the Lwanho River, will be tapped at the earliest date.

Air transport service in North China must be expanded as well. At present, the Huitung Company is operating five lines, between Tientsin and Chingchow, Tientsin and Peking, Peking and Changteh, Tientsin and Airen, Peking and Kalgan. The firm must extend its service to Taiyuan, Suiyuan, Tsinan and Tsingtao and to connect Tsingtao with Dairen and Fukuoka.

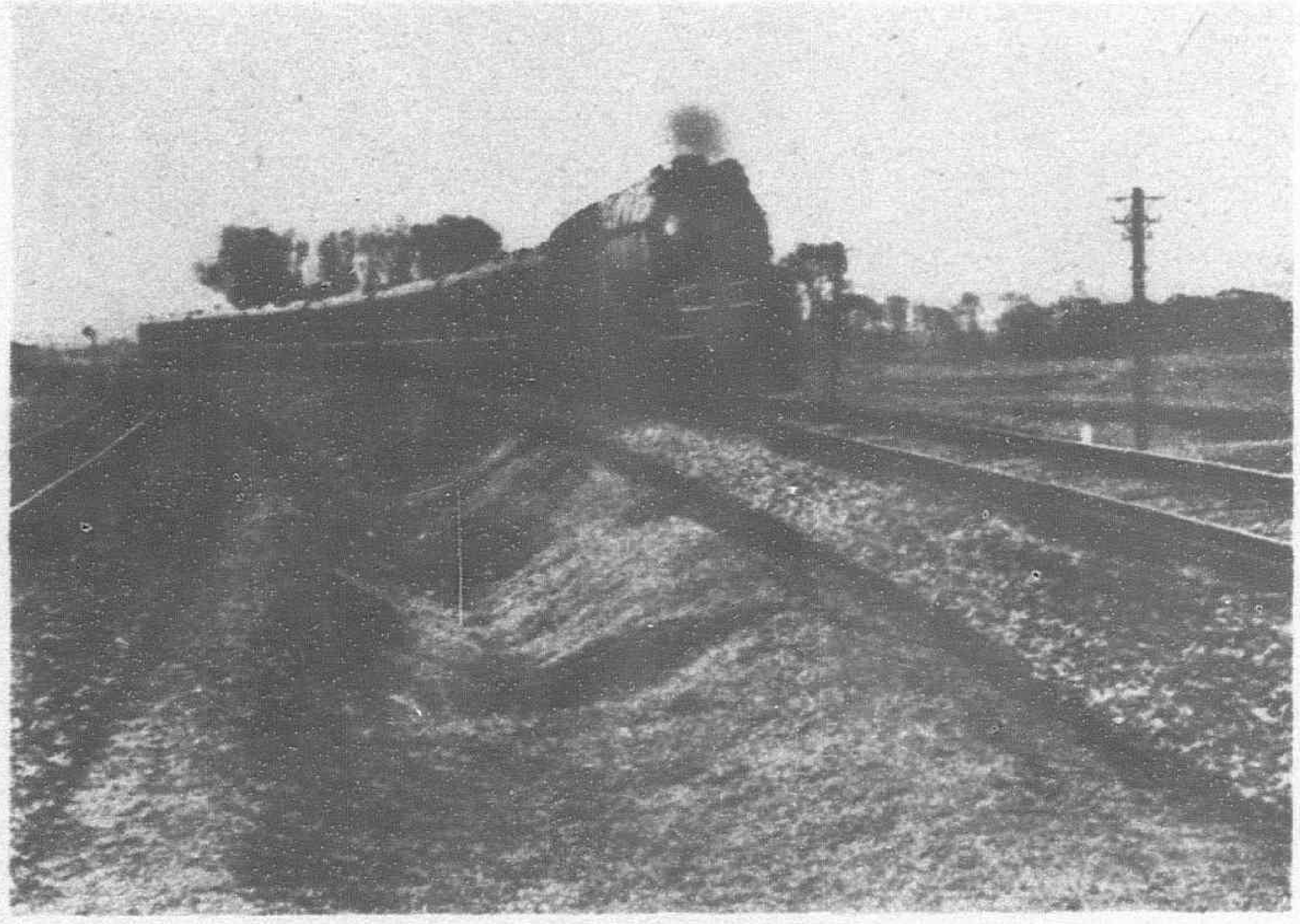
Manchoukuo's Second-Stage Construction Program

From Contemporary Manchuria, September, 1937

In the brief span of five years, the youthful State of Manchoukuo, through the wholehearted support of the friendly Empire of Japan and the concerted, unremitting efforts of the Government and people, has succeeded in laying a solid foundation for its administrative and economic structures. The past five years, in other words, was a period of preparation for future development. In its administrative, financial, economic and industrial policies, the new State has exercised self-restraint in order to be sure first of all of a firm basis on which its future expansion is to depend. The Government has consequently avoided bold experiments in finance, upholding a sound financial policy, and in the realm of industry, it has refrained from excessive undertakings, contenting itself with basic, factual investigations, while endeavoring to stabilize the livelihood of the people.

Immediately after the founding of Manchoukuo, the people were apt to feel uneasy over the prospects of the political situation, while the authorities were kept busy exterminating banditry and preserving peace and order. Floods and famines also occurred frequently to hamper the economic activities of the nation, which were further adversely affected by the world-wide economic depression.

The economic difficulties which caused frequent declines in the prices of Manchurian staple products were finally overcome after five years' strenuous efforts on the part of the Government and people, and during this period the Government succeeded in completing the groundwork for the nation's future development. The stage, in other words, has been set for positive activity along all lines of national endeavor. As the first step in this direction, the Government at a conference of Provincial Governors and the Director of the General Affairs Board of the State Council, held at the beginning of this year, announced the outlines of the new national construction program for the execution of which the huge expenditure of two and a half billion yuan is needed.



"Asia," the South Manchuria Railway's stream-lined super-express

The second-period construction program is so designed as to meet the need of strengthening the Japan-Manchoukuo economic bloc and to enable Manchoukuo to develop resources necessary for national defence, secure self-sufficiency in goods needed for consumption within the country and to supplement the resources of Japan. The nucleus of this program is a five-year industrial plan, having for its objects (1) the establishment of important industries and (2) the promotion of national economy.

I.—The Establishment of Important Industries

With a view to promoting industries for the purpose of stabilizing permanently the livelihood of the people and of enhancing the relationship of co-existence and mutual prosperity between Manchoukuo and Japan, the second-period industrial program calls for the development of natural resources and such industries as coal mining, iron mining and the liquefaction of coal.

Coal Mining.—Coal is the most important mineral in Manchoukuo, with an estimated deposit of over ten billion metric tons. In view of its great value as the principal motive power in modern industry and of the rapidly increasing domestic and Japanese demand for the product, the Manchoukuo Government has decided to raise the capital of the Manchuria Coal Mining Company, a Japanese-Manchoukuo joint enterprise, from 16,000,000 yuan to 80,000,000 yuan in order to increase the annual production of coal to 26,000,000 tons during the next five years. Efforts will also be made to open up new mines.

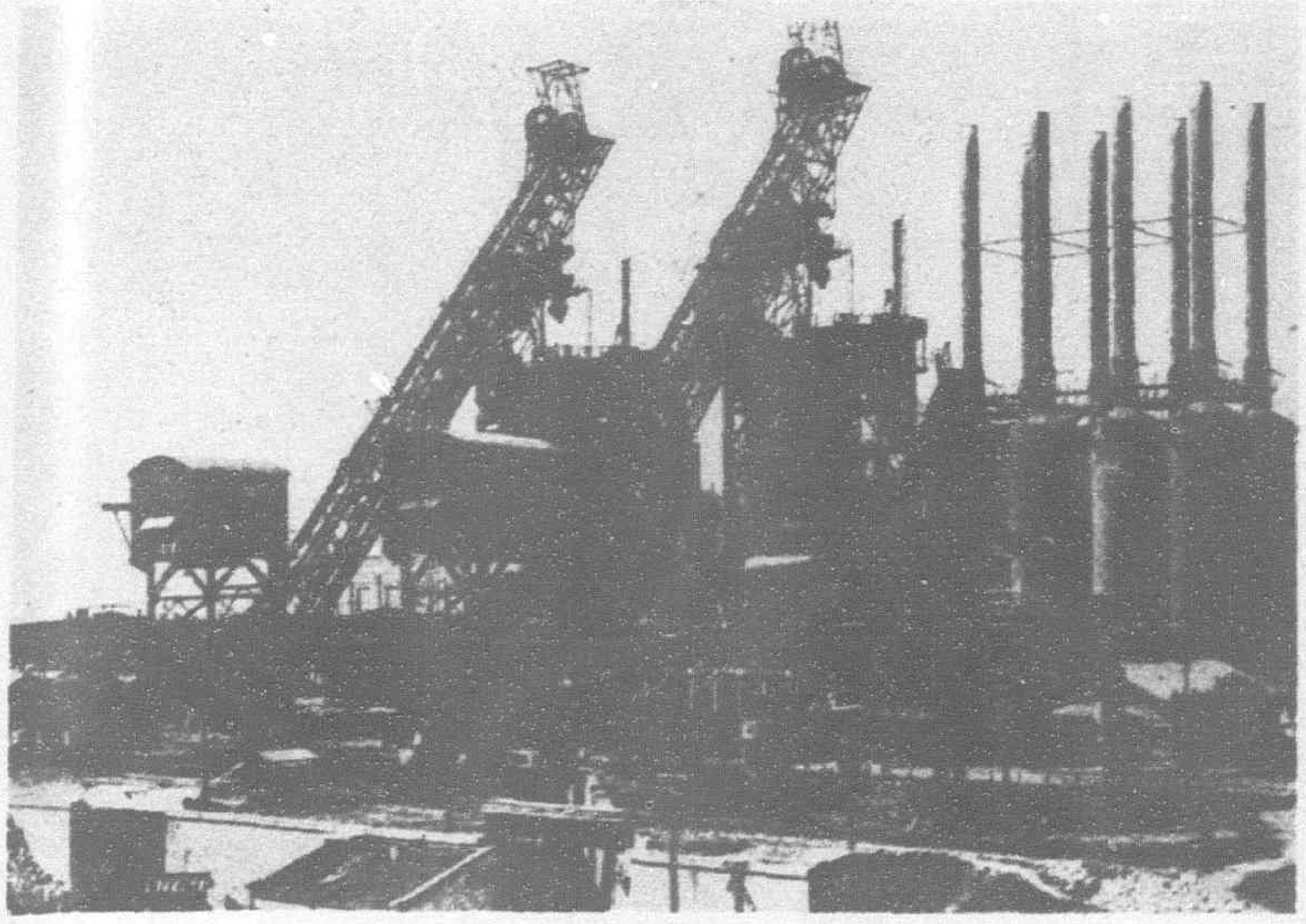
In 1931, the year before the birth of Manchoukuo, the domestic coal output amounted to 9,200,000 tons, of which 70 per cent or 6,520,000 tons were mined at the Fushun Colliery. In 1935 the production reached 11,670,000 tons, including 8,380,000 tons of Fushun coal, an increase of 2,470,000 tons over the 1931 output. As the above figures indicate, though the output of Fushun coal alone has markedly gained since the establishment of the new State, the production in Manchoukuo, excluding the Fushun coal field, has not shown much increase despite the existence of extensive coal resources in the country. Under the circumstances, the five-year plan aims to increase chiefly the output of the mines belonging to or affiliated with the Manchuria Coal Mining Company.

Iron and Steel Manufacturing.—The iron industry is also given primary consideration in the five-year plan, because of its direct bearing on national defence and its indispensability to communications and construction enterprises. In this important mineral, however, Manchoukuo is still largely dependent upon foreign countries for its supply. The five-year plan proposes therefore to make the new State self-sufficient as far as iron is concerned. For this purpose, a systematic exploitation of its iron deposits, estimated at 1,200 million tons, is projected along with the expansion of the Showa Steel Works at Anshan and the Penhsihu Iron Works on the Mukden-Antung line and the employment of modern methods of ore refining to boost the domestic production of the metal.

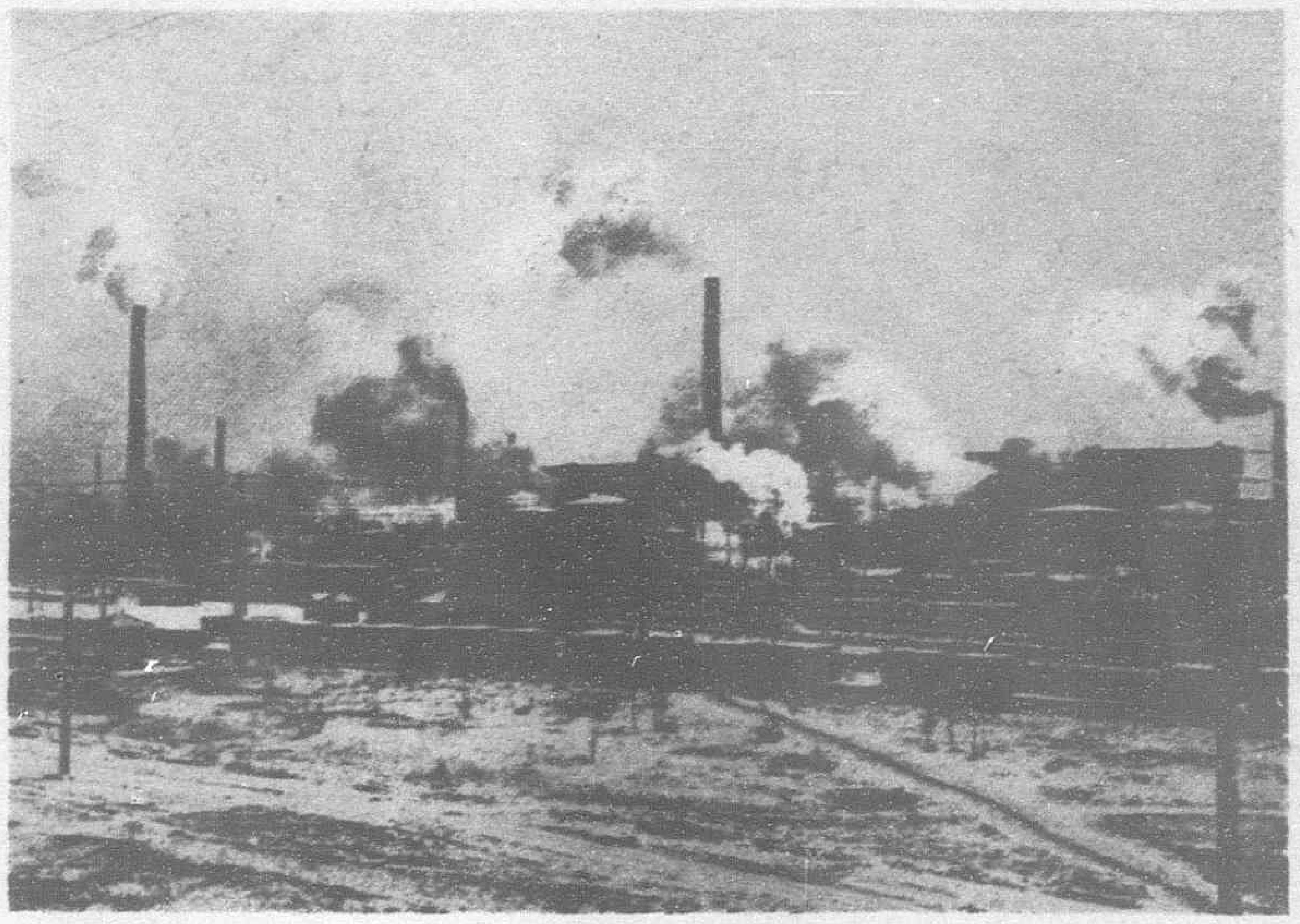
Liquefaction of Coal.—The rapidly increasing domestic demand for liquid fuel and the dearth of petroleum resources in the country have turned Manchoukuo's attention to the manufacture of substitute liquid fuel through the process known as the liquefaction of coal in order to solve the oil problem. The new State is fortunately well-equipped for this purpose, endowed as it is with an almost inexhaustible supply of coal. As the first step towards a solution of the oil problem, a coal hydrogenation plant is under construction at Fushun, the site of the world-famous open-cut mine, and new plants will be built at Fuhsin (Chinchou Province), Holung (Chientao Province), and at Ssupingkai (Fengtien Province). The largest of its kind, the projected company at Fuhsin will be a Japanese-Manchoukuo joint enterprise capitalized at Y.50,000,000. In addition the Government is giving every possible assistance to the development of the oil shale industry.

Light Metallic Industry.—Manchoukuo, being rich in minerals for the light metallic industry, the magnesium and aluminium manufacturing industries have sprung up. In the districts around Tashihchiao, a huge deposit of excellent magnesite ore, estimated at one billion metric tons, is found. In order to exploit the magnesite deposits there, the Japan-Manchoukuo Magnesium Company has been established with a capitalization of 7,000,000 yuan. The Company has two large plants in Japan and manufactures metallic magnesium out of Tashihchiao magnesite ore.

Aluminium manufacturing in Manchoukuo holds bright prospects. Raw materials for the manufacture of aluminium, particularly aluminium shale, are found abundantly in Manchuria. The Japan-Manchoukuo Aluminium Manufacturing Company has been incorporated with a Y.25,000,000 capital, and its plant, now



Showa steel works, Anshan



Shale oil plant, Fushun

under construction at Fushun, is expected to commence operations this fall.

Electric Industry.—Owing to the almost inexhaustible coal deposits in Manchuria, electricity is generated entirely by caloric heat and nothing has so far been done to harness the vast hydraulic resoures of the country which, it is estimated, are capable of producing constantly a supply of 1,500,000 kilowatt-hours of electricity. In order to meet an increasing demand for electric power, a concrete plan for the development of the hydro-electric industry under State management has been worked out in conjunction with the five-year industrial plan. According to the plan, 590,000 kilowatts will be generated by hydraulic power. At the same time, electric power generated by caloric heat, which at present amounts to 420,000 kilowatts, will be increased to 810,000 kilowatts.

Under the Government's ambitious project, a huge reservoir, 35 square *ri* (one *ri* equals about 2.45 miles) in area, will be built by damming the Second Sungari at a point 24 kilometers up the river from Kirin, and a large hydro-electric plant capable of generating 180,000 kilowatts will be constructed on the site. The projected reservoir will be of threefold benefit : first, as already mentioned, the water can be utilized for generating electric power ; second, the inundation by floods of about 160,000 *chobu* (one *chobu* is about 2.45 acres) of land in the lower reaches of the river can be prevented ; and third, water from the reservoir can be utilized for irrigating dry districts for farming.

The first-stage construction program will be completed five years hence. Under the second-stage construction program, it is planned to raise the maximum depth of the reservoir water by 12 meters and to increase the generating capacity of the plant to 200,000 kilowatts.

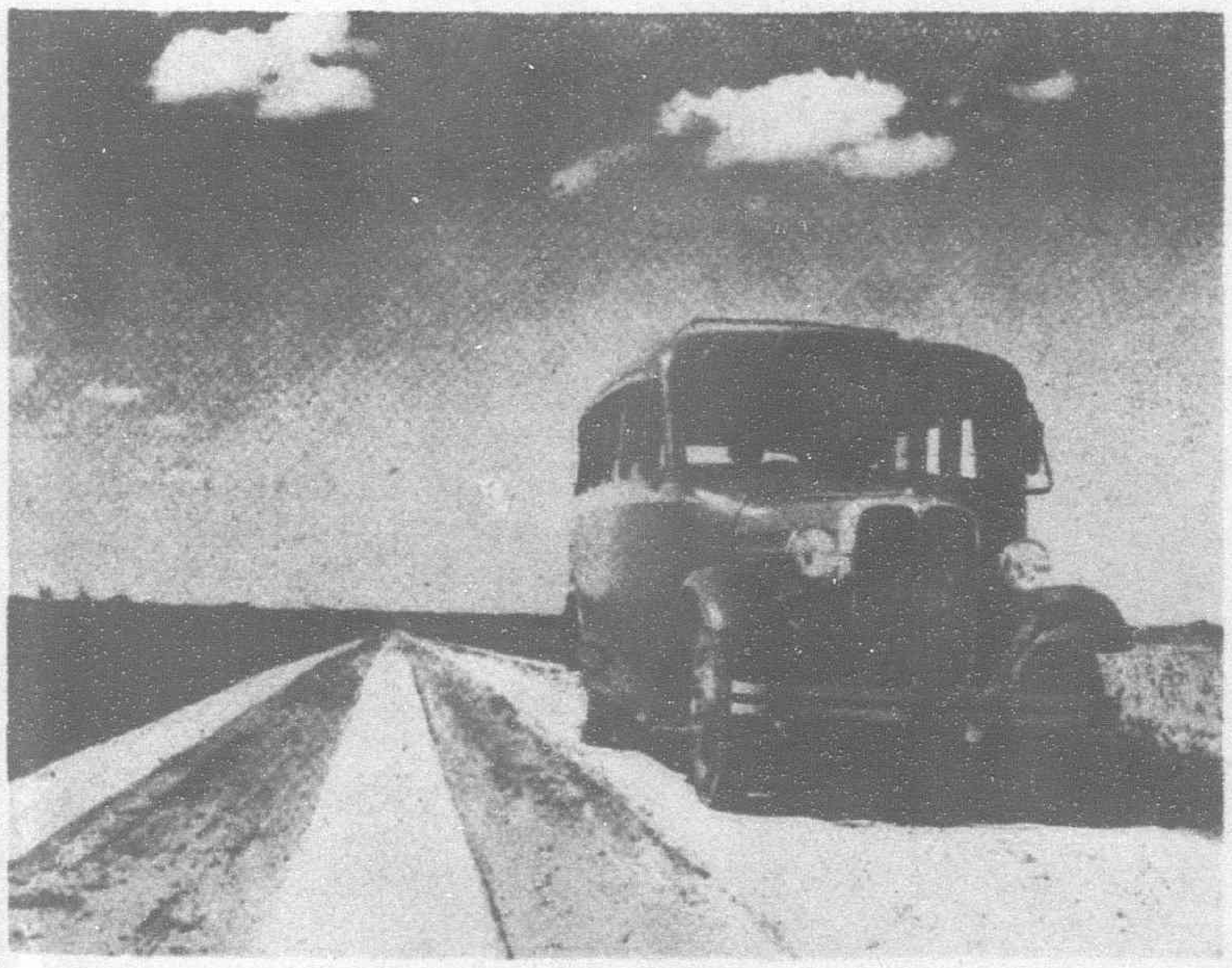
In order to facilitate the industrial development of the Tungpientao district and North Chosen, the Japanese and Manchoukuo authorities have reached an agreement to harness the waters of the Yalu River. For this purpose, the Yalu River Hydro-Electric Company will be founded with a huge capital of Y.100,000,000 to be invested jointly by Japan and Manchoukuo. Upon completion of the first stage of the project which is to be spread over three years and which calls for the generation of 500,000 kilowatts of power, the Company's capital will be increased to Y.300,000,000 and the generating capacity raised to 1,500,000 kilowatts.

Pulp Manufacturing.—Having completed a survey of the forest resources of North Manchuria, the Government has decided upon their immediate exploitation with the object of producing 120,000 tons of pulp annually. Proper measures will also be devised to accelerate the development of the industry for manufacturing pulp from materials other than lumber, such as kaoliang and bean stalks and reeds, in consideration of the increasing demand for pulp in Japan.

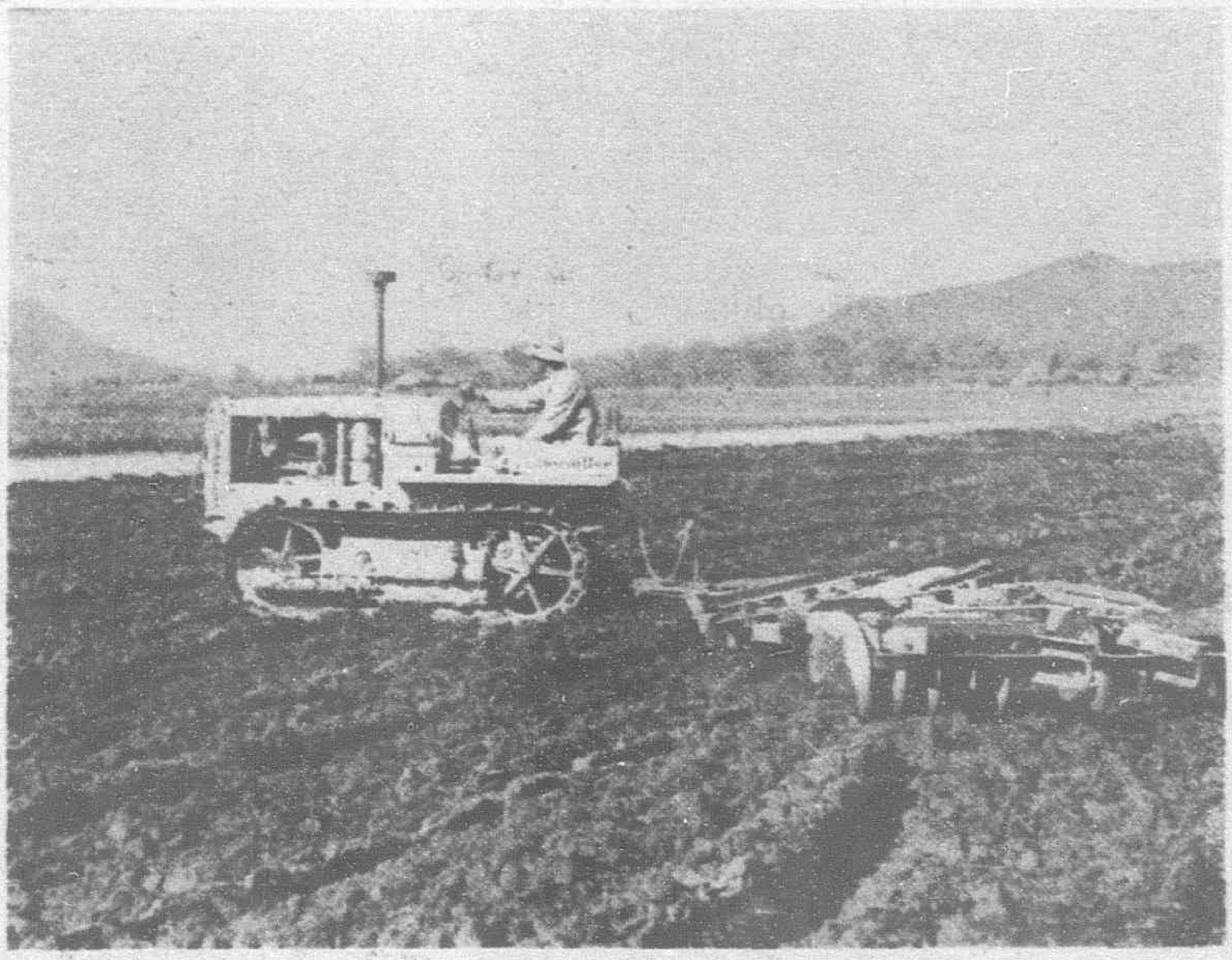
Gold Mining.—The production of Y.200,000,000 worth of gold within the next five years is the aim of the Government, and for this purpose adequate steps will be taken to encourage gold mining. The present annual production is around 10,000,000 yuan.

II.—Promotion of National Economy

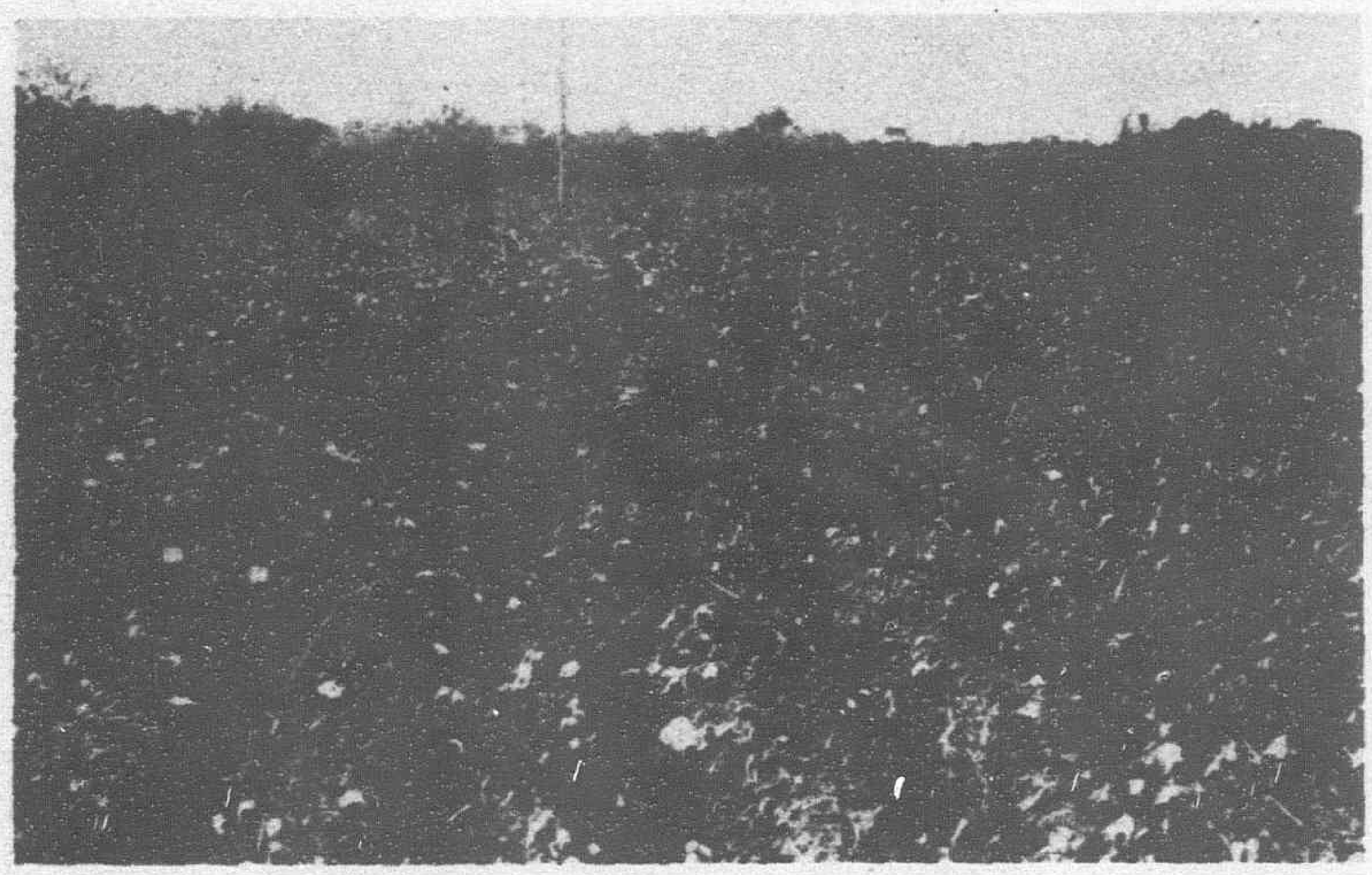
Agriculture is the backbone of Manchoukuo's national economy. As the greater part of Manchoukuo's population consists of peasants, there is no need to emphasize the fact that the development of her national economy rests upon the prosperity of her rural economy. The Government consequently has been making every



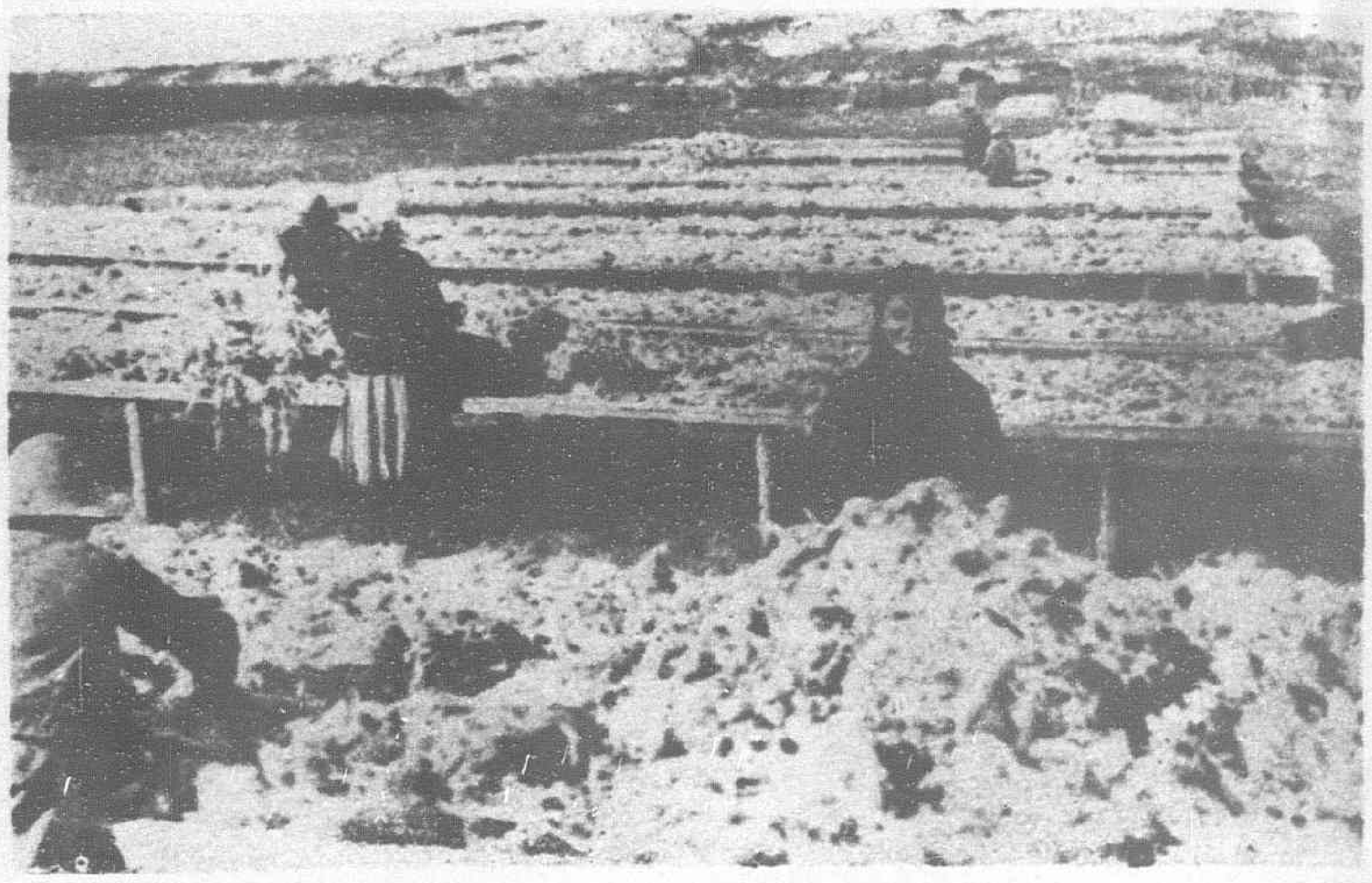
Bus line over a new Manchoukuo State Highway



Disk harrowing with a 25 horse-power tractor near Fenghuangcheng



Cotton growing in South Manchuria



Wool industry in Hsingan Province

possible effort to rehabilitate the rural communities by increasing the output of agricultural products, improving their quality and farming methods, rectifying rural finances, and by reorganizing the rural social structure. The agricultural communities, however, are still in an impoverished condition owing to various adverse factors. The Government has consequently, as a fundamental measure for the rehabilitation of rural communities, drawn up a five-year agricultural plan.

(1) *Promotion of Rural Economy.*—The plan in question aims to establish in place of the one-crop system of cultivating soya beans, as a source of farm income, diversified farming in an effort to resuscitate rural economy. The five-year plan, during the first year of its operation, calls for a total expenditure of 5,000,000 yuan, comprising 3,000,000 yuan for encouraging increased agricultural production, and 2,000,000 yuan for the prevention of blight, the encouragement of the use of improved farming implements, the establishment of agricultural experimental stations, the cultivation of new farming lands, and the training of agricultural instructors. Coupled with the increased agricultural production, the new system, it is hoped, will bring prosperity to the farming population.

The principal agricultural products whose output is to be increased are wheat, rice, oats, barley, lucerne, kenafe (Manchurian hemp), flax, castor-beans, raw cotton, tobacco, sugar beet, soya beans, kaoliang, millet, and maize. Special attention will be paid to wheat-growing in North Manchuria and cotton cultivation in South Manchuria.

Wheat.—The increased domestic production of wheat, the demand for which is increasing yearly, is absolutely essential for making Manchoukuo self-sufficient in this product and for expanding the domestic flour-milling industry. It is planned to increase last year's wheat crop area by 10 per cent to 1,100,000 hectares this year and some 320,000 yuan has been appropriated by the Government for this purpose.

Raw Cotton.—A new five-year cotton cultivation plan was launched this year to replace the 20-year plan enforced since 1933 with the object of producing 250,000,000 kin (one kin equals 1.32 pounds) of unginned cotton annually after 1941 from 180,000 hectares of cotton fields in South Manchuria.

Special attention will be paid to the cultivation of upland cotton instead of the native variety which is to be eventually replaced by the former. Even at present the yield from upland cotton is far greater than that from the native variety. Along with the increasing activity of the Manchuria Cotton Association and the Manchuria Cotton Company, it is anticipated that cotton cultivation in South Manchuria will soon be placed on the right road to development.

Kenafe.—Though new in Manchoukuo, the cultivation of kenafe shows much promise of developing into an important industry in the not far off future. In order to encourage its production among the agricultural population, the Department of Industry this year purchased for distribution 8,000 yuan worth of kenafe seeds from State-commissioned seed farms in Liaoyang-Hsien, Yingkou-Hsien, Haicheng-Hsien, Kaiping-Hsien, Fu-Hsien, Hsinmin-Hsien, Taian-Hsien, and Chin-Hsien. It is also planned to increase last year's area of seed farms to 250 hectares this year.

Flax.—In order to meet the increasing demand for flax in Japan and Manchoukuo, plans have also been drawn up for boosting this year's flax production, which is estimated at 15,000 tons, to 70,000 tons five years hence. Thus a bright future is in store for the domestic hemp-manufacturing industry.

(2) *Stock-farming.*—As regards stock-farming, the authorities concerned are planning to improve and increase the existing stock of sheep, by introducing superior strains imported from abroad and by establishing adequate facilities. The five-year plan aims to increase the existing breed of sheep, numbering some 3,000,000, to 4,000,000 and to produce 4,740,000 tons of wool. At the same time, in view of the untold damages caused by live-stock epidemics rampant almost all the year round, every effort will be made to prevent and exterminate the diseases.

In co-operation with the Department of Industry, the Office of Hsingan Affairs, until recently the Department of Mongolia Administration, has also worked out a five-year plan for the agricultural development of Mongolia by the introduction of modern methods of production and for improving and increasing the existing breed of Mongolian sheep. Among the several measures planned to this end are the founding of the Hsingan Institute in Hailar for training veterinary surgeons, the establishment of sheep farms at Puhsi and Lupei and live-stock farms in banner districts, the opening of co-operative communities, the encouragement of cultivation, and a readjustment of important facilities for the local farming industry.

(3) *Immigration from Japan.*—Nearly 3,000 Japanese settlers have migrated to Manchoukuo through the good offices of the Tokyo Ministry of Overseas Affairs and other organizations since 1932, and the satisfactory results shown by these immigrants, despite the terrible hardships they have suffered, have led the authorities concerned of Japan and Manchoukuo to draw up a definite plan of large-scale Japanese colonization in Manchoukuo. According to the plan, a total of 1,000,000 Japanese households, numbering

Lumbering industry in East Manchuria

5,000,000 persons, are to immigrate to Manchoukuo during the next twenty years. During the first five years, 100,000 families, totalling 500,000 persons, will settle in Manchoukuo, about 6,000 families being expected to arrive during the current year. The skill and labor of Japanese immigrant farmers will no doubt prove greatly helpful in the execution of Manchoukuo's industrial development, especially in promoting the cultivation of rice, wheat and barley.

In view of the important part Japanese immigrants are to play in the second-stage construction of the new State, the Manchoukuo Government, in order to effect smooth execution of the 20-year immigration program, plans to enlarge the scope of the Manchuria Colonization Company and other official and private organizations concerned with Japanese immigration and to provide all available facilities for their colonization.

III.—Transportation and Communications

(1) *Railways.*—Probably the most noteworthy progress witnessed in Manchoukuo since her foundation is the development of communications. Whereas in 1907 when the South Manchuria Railway Company first undertook the management of railways, there were only 1,000 kilometers of railways in Manchuria, the length of all the lines, including those under construction, is expected to exceed 10,000 kilometers by the end of this year.

Under the fourth-stage railway construction program launched this year, the Department of Communications plans to build, in addition to the lines already projected, 300 kilometers of new lines (chiefly in North Manchuria) yearly during the next five years as well as encouraging the construction of about 1,000 kilometers of privately-owned railways by granting subsidies.

(2) *State Highways.*—The Department of Communications also plans to build 13,000 kilometers of State highways during the five-year period beginning 1937. At the same time some 8,000 kilometers of roads already completed will be improved to facilitate transportation. The present policy of bus line management will be followed and all bus services on what are regarded as important highways will be managed by the Government through the General Directorate of Railways. The other bus lines will be left to private management.

(3) *Other Means of Communications.*—As to the other means of communications, every effort will be made to develop them to meet the needs of a growing State.

IV.—Financial Plans

Some idea of the nature of Manchoukuo's second stage construction program may be obtained by considering the policy which guided the Government in the compilation of this year's budget. An increase in general administrative expenditure was avoided wherever possible, but the largest possible appropriations within the limits of sound finance were set aside for stabilizing and promoting the livelihood of the nation. The Government also decided to resort to loan floatation as a source of revenue with which to finance undertakings for the development of industry. Inasmuch as taxes and Government monopolies have an important bearing upon private business and the livelihood of the nation, it has been decided to devise the following measures by taking into consideration finance, production and national livelihood.

(1) *The Internal Taxation System.*—In the internal taxation system nationwide co-ordination and readjustment were effected last year, and the whole system has since been completely modernized. Local taxation, the customs and monopoly systems will also be so readjusted as to distribute the tax burdens equally and provide elasticity to the financial resources of the nation.

(2) *The Customs System.*—The customs tariff has been revised several times since Manchoukuo took over the Maritime Customs with the result that the nation's trade continues to grow with a corresponding rise in customs revenue year after year. A fundamental revision of the customs tariff and improvement in the customs clearance procedure are now being planned with a view to promoting domestic industry, effecting a rational readjustment of Japan-Manchoukuo trade and lightening the tax burden of the people.

(3) *The Monopoly System.*—The monopoly system of Manchoukuo was formerly confined to opium, petroleum, and a part of the salt output of the nation, but starting from the current year, the country's entire salt production and matches have been placed under Government monopoly. As a result, the price of salt has been reduced from 10.16 yuan to 7.95 yuan per 100 kin. This reduction means a saving of approximately 6,000,000 yuan by consumers annually. Hereafter the Government will endeavor to readjust rationally the prices of monopoly products, to increase their output and to facilitate their distribution with a view to effecting smooth operation of the monopoly system.

(4) *Finance.*—The Government also plans to facilitate the smooth operation of financing business and to supply funds necessary for industrial development by giving full play to the functions of the newly-established Industrial Bank of Manchou and of the Central Bank of Manchou. At the same time it will direct its efforts towards effecting general improvements in the ordinary banks, establish additional rural credit co-operative associations, found urban credit co-operative associations, increase their efficiency and lower their interest rates in order to help the financing of middle and small class commercial and industrial firms and rural communities.

V.—Industrial Development Plan

Funds needed to finance the five-year industrial development plan are, as previously mentioned, two and a half billion yuan. Of this amount about 500 million yuan can be raised in Manchoukuo and the remaining two billion yuan will have to be raised in Japan. While there have been conflicting rumors as to the possibility of raising such an enormous sum in Japan, it is not believed impossible in view of the past Japanese investments in Manchoukuo and the recent financial condition of Japan. Japanese investments have amounted to almost 300 million yuan annually since 1933, and especially in 1935 they showed a sudden increase to 400 million yuan.

Inasmuch as the five-year plan aims at a general industrial development of the country, including the projects already decided upon, the necessary funds represent practically the total amount of investments to be made in Manchuria. Accordingly, for the execution of the plan only a small additional investment of 50 to 60 million yuan is needed on top of the average annual investment now being made in Manchoukuo. The successful completion of the five-year plan will, no doubt, contribute greatly to the industrial development of both Japan and Manchoukuo, the promotion of trade between the two countries, as well to the improvement of their balance of international payments.

Aid Asked for Chinese Cotton

Alleviation of the exchange restrictions that prevent the importation of North China cotton into Japan is asked of the Finance Ministry in two petitions submitted by the Tokyo Chamber of Commerce and Industry acting on behalf of the Tientsin Raw Cotton Traders' Guild, and the Osaka Chamber of Commerce and Industry. A figure of 1,500,000 piculs is suggested as the amount that should be bought from the Chinese.

The petition submitted by the Tokyo body on behalf of the Tientsin traders expresses the hope that the Japanese Government will discriminate between imports of raw cotton from North China and those from America and British India in the operation of the exchange control law. Permission to purchase 1,500,000 piculs is suggested. Of this amount 1,050,000 piculs would be of the American variety, suitable for spinning, and the remaining 450,000 bales would be native cotton to be used for other purposes.

The hope is also expressed that the Government will take "especially quick action" to permit the transfer of a fairly large part of the cotton stocks accumulated in Tientsin, since this action would permit a revival of business there. The desirability of completing the transaction before the end of the year is also suggested.

"It is hoped," the petition continues, "that Japan will make an effort to restore transportation facilities in North China."

The Singapore Airport

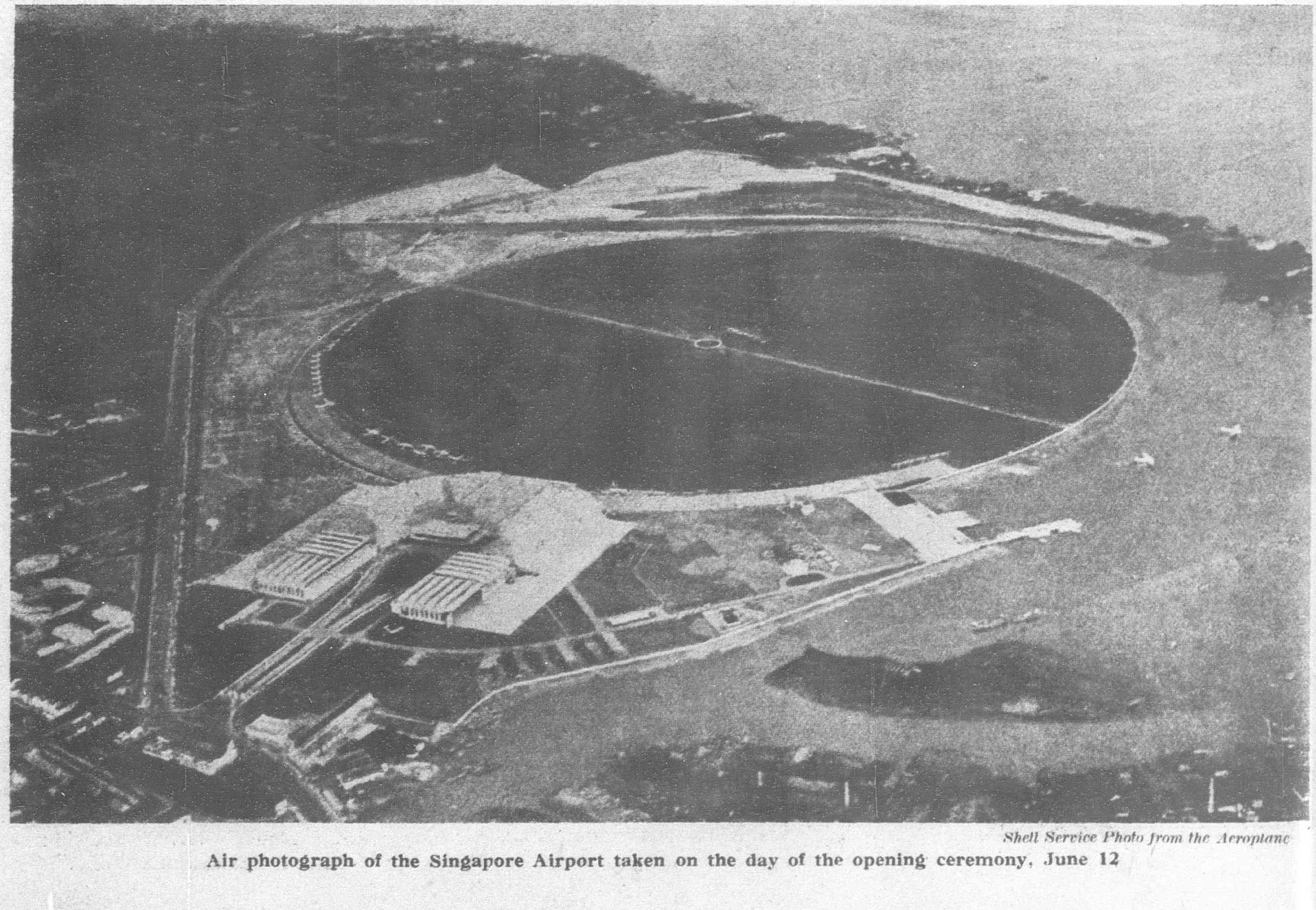
Reprinted from The Engineer

THE Singapore airport, recently opened by His Excellency Sir Thomas Shenton Whitelegge Thomas, is the Empire's greatest overseas air base. Constructed as both a land and sea station, it differs fundamentally from most other airports, and many firms were associated with the erection of the buildings, slipways, channels, etc. The landing ground, which occupies some 162 acres of a reclaimed area of 262 acres, is, as shown in Fig. 1, circular with a diameter of 1,000 yards. Owing to the rainfall in the territory being 95-in. per annum, some 40 miles of special subsoil drainage had to be undertaken. The landing ground is slightly mounded with a gradient of 1 in 160. All the buildings have been arranged with a view to reducing obstructions to aircraft to a minimum, and a full run of the ground in any direction is possible. With hangars on either side, the terminal building caters separately for inward and outward traffic. It possesses a post office, telephones, a restaurant, bureau de change, medical and Customs sections, offices for the principal navigating lines, and airport staff, and the usual travel amenities, such as newspaper, tobacco kiosks, etc.

The control tower from which all aircraft traffic is regulated is 50-ft. high. It is reached by a lift and has a fully equipped wireless station. From this control tower (Fig. 2) the aerodrome lighting is also controlled. Orange colored boundary lights (Fig. 3) are spaced at intervals of 100 yards round the landing ground, and red obstruction lights are provided on the buildings. An illuminated wind tee (Fig. 4) and six G.E.C. evenly spaced airport floodlights (Fig. 5) illuminate the landing surface. Other floodlights round the terminal building and hangars give general illumination. On the roof of the control tower is a Neon beacon for the guidance at night of approaching aircraft, which receives additional assistance, at the will of the control officer, from apparatus flashing in Morse code the letter of S, representing Singapore. From the control tower the seaplane channel and anchorage lighting are also controlled.

The two aeroplane hangars at present constructed each measure 300-ft. by 150-ft., with a clear height of 35-ft., and are capable of comfortably housing the largest air liners built. Each hangar has two entrances arranged to make the handling of aircraft in a crowded hangar simple. Along the full length of each hangar is a two-storied annexe, giving accommodation for offices, stores, and workshops of the air transport companies. Road access to each annexe is separate from the approach road for passenger traffic. Surrounding the terminal building and hangar entrances is a 15-acre concrete pavement, and all concentrated aircraft movements and the handling of mail, goods, etc., is therefore carried out on a clean hard surface. To mitigate glare the pavement immediately in front of the terminal building has been laid with green concrete. To the right of the terminal building is a fire station with the latest type of fire tender, capable of directing jets of water, foam, or carbon dioxide on to any conflagration within the airport. At suitable intervals in the main buildings there are also fire hydrants.

On the western perimeter of the landing ground are the seaplane slipway and wharf. The former has been designed for a load of 84 tons, is 100-ft. wide and is inclined at an angle of 1 in 15. Its total length is 262-ft. and the end is submerged at the extreme low tide to a depth of 5-ft. For hauling up any flying boat which may have to be taken from the water for overhaul or repair four lines of rails are laid flush in the concrete decking. At the head of the slipway is a level paved area for handling flying boats and seaplanes



Shell Service Photo from the Aeroplane

Air photograph of the Singapore Airport taken on the day of the opening ceremony, June 12

and is connected by a taxi strip to the main hangars. If developments render it necessary, a hangar will be erected at the head of the slipway for the special use of marine aircraft. The wharf provides a convenient means of transhipping passengers, mails, and stores to marine aircraft, a 2-ton crane being provided for handling aircraft engines and heavy stores.

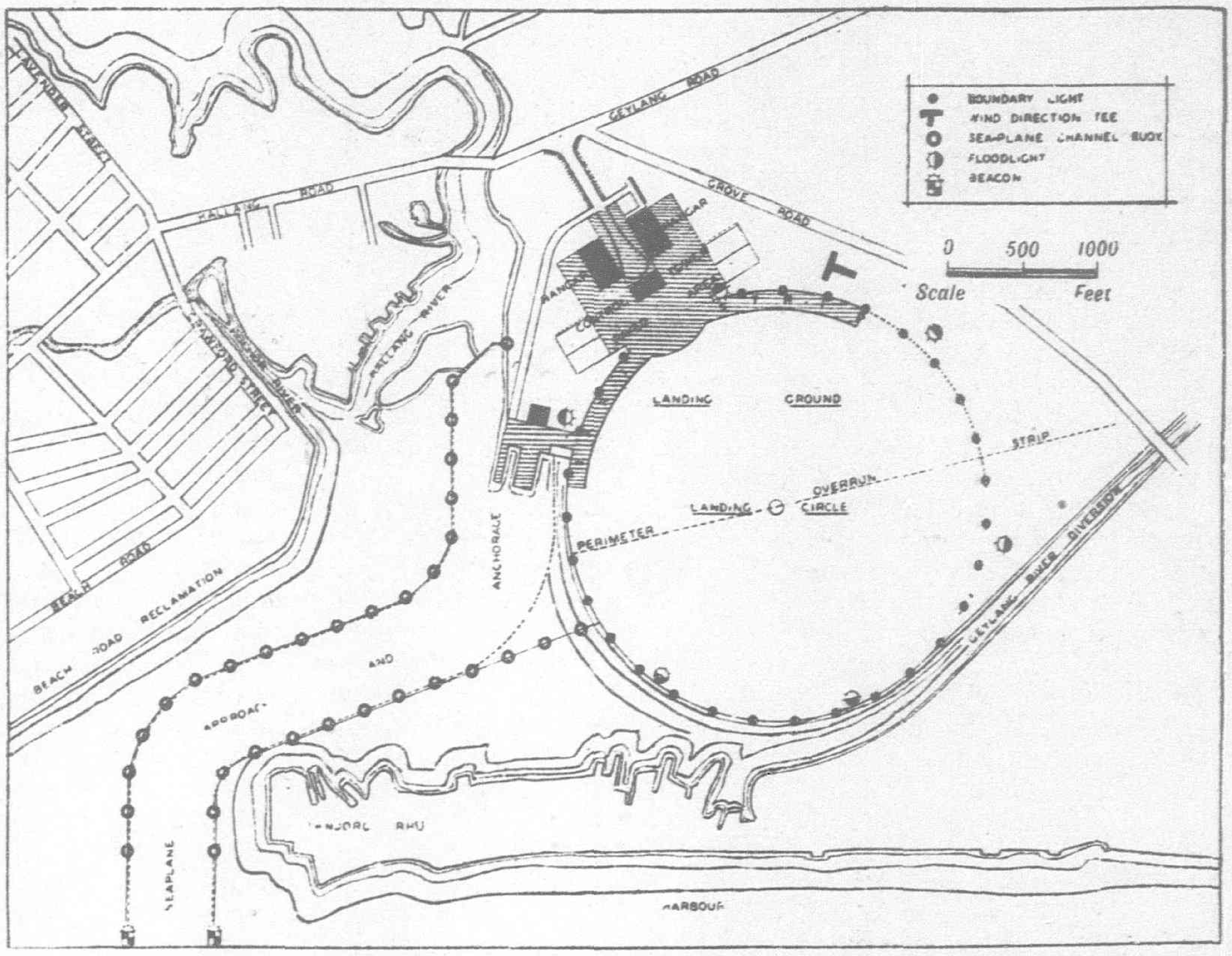


Fig. 1—Plan of Singapore Airport

The waterway from the slipway to the open sea is a dredged channel 600-ft. wide, about a mile long, and with a minimum depth at low tide of 6-ft. On either side it is flanked by a continuous timber boom to exclude floating *debris* and other obstructions. At night it is defined by electric lights (Fig. 6) at 300-ft. intervals, and at the seaward end by two beacons, operated from the control tower of the terminal building. Other features of the airport are a fully equipped meteorological station, premises for the Royal Singapore Flying Club, sites for oil companies, and garages for staff and visitors' cars, etc.

For the following particulars of the lighting system we are indebted to the General Electric Company, of Magnet House, Kingsway, W.C.2. The six landing floodlights are similar to those at the Croydon Aerodrome, but are contained in special housings composed of Urastone, and are provided with a fan. One of these housings is glazed all round, and when it is required to illuminate the channel for flying boats or seaplanes, it can be rotated through 360 deg. Every floodlight is equipped with Osram 1,000-watt tubular horizon type lamps, and the total beam intensity of each is over 1,000,000 candle-power. Two floodlights are used at a time, when practically all the landing area is illuminated to the extent of not less than 0.15 foot-candle. To enable pilots to ascertain the correct direction in which to land or take off, according to the direction of the wind, an illuminated G.E.C. wind tee (Fig. 4) has been installed.

With a consumption of 3 kw., balanced across the three-phase supply, the Neon beacon on top of the control tower burns with a brilliant red, and is visible for about 50 miles. The standard G.E.C. system of boundary lights consists of twenty-nine orange globes. To prevent the possibility of aeroplane wings hitting them, the boundary units adjacent to the taxi strip are shorter than usual, but the other boundary lights have cones and the center stem has a weak link to permit collapse when struck. The lights are fed through a mains transformer connected by a single-core underground cable with individual isolating transformers, since the Osram lamps are rated at 6.6-volts and 6.6 amperes. From a simple G.E.C. control desk in the control tower, with tumbler switches, pilot lights, and suitable labels, this equipment is remotely controlled. All dangerous obstructions are fitted with G.E.C. obstruction lights, with red globes mounted in pairs, and with a 60-watt lamp wired on a separate circuit.

A large number of G.E.C. lighting fittings of various types are in use. In the hangars there are special hanging sockets suspended by flexible steel wire and lowered by winches on the side walls. To ensure relative safety when headlamps, etc., are plugged into the hanging sockets, the current is supplied at 110-volts through a 5 kva transformer.

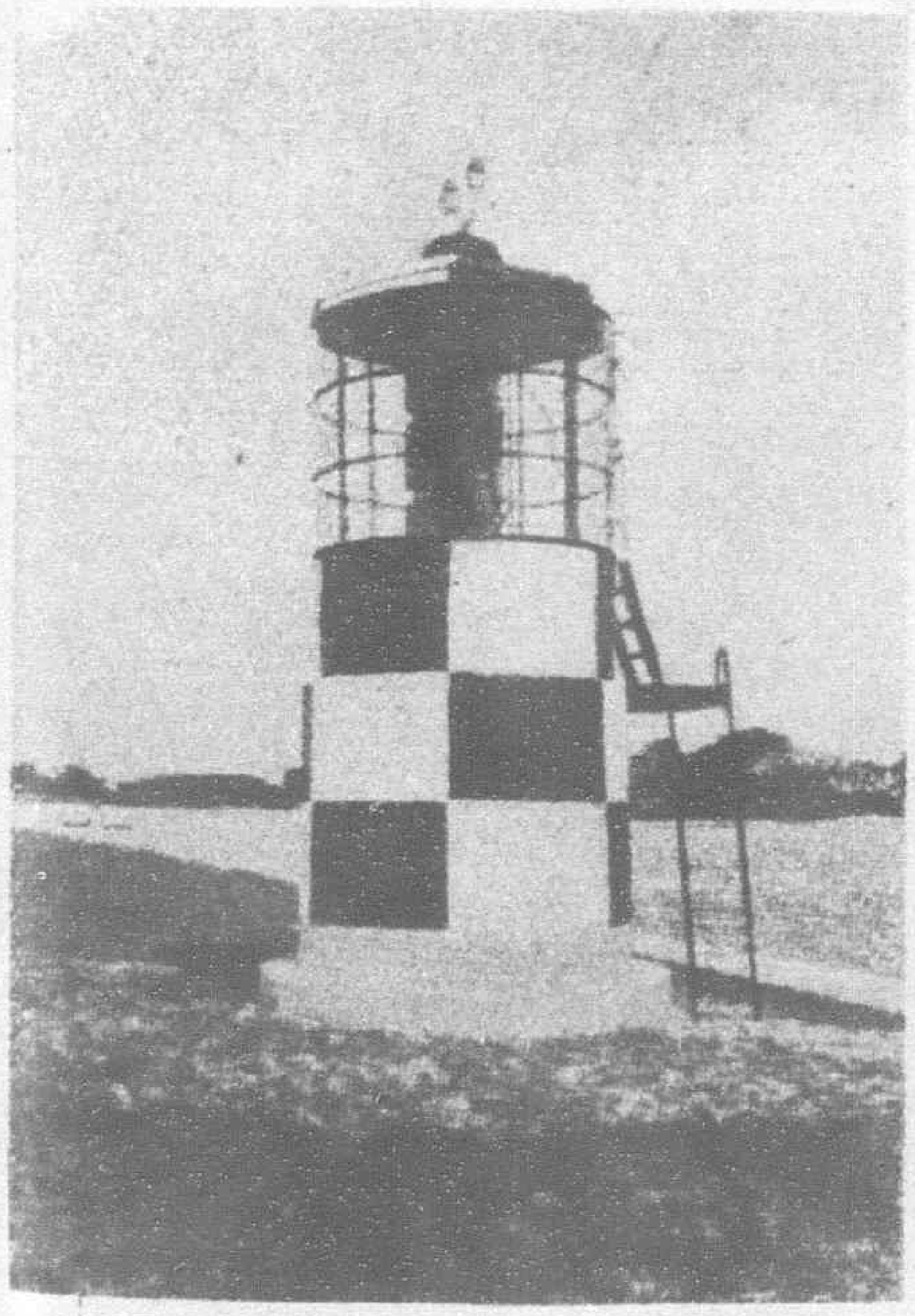


Fig. 5—Landing floodlight

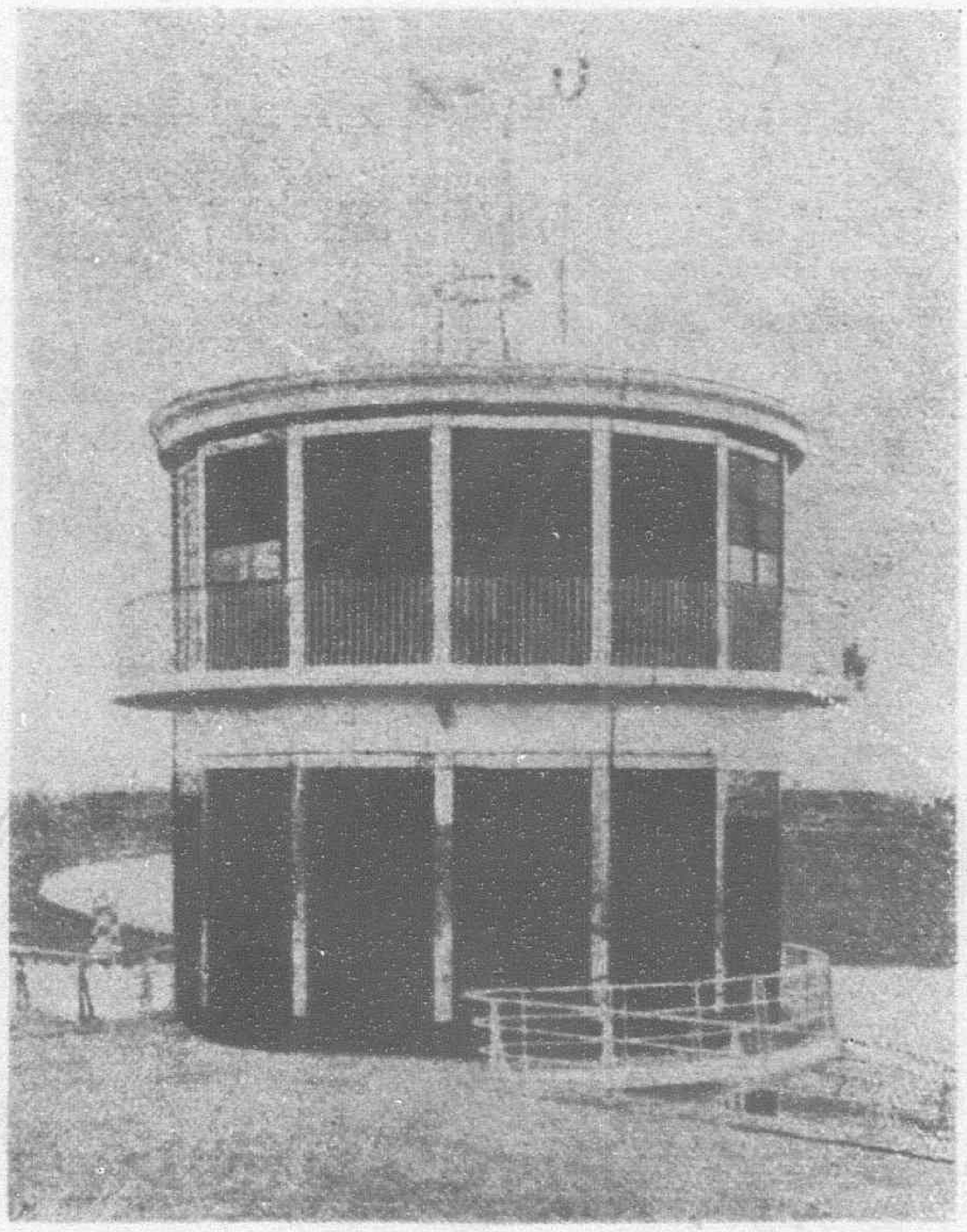


Fig. 2—Control tower

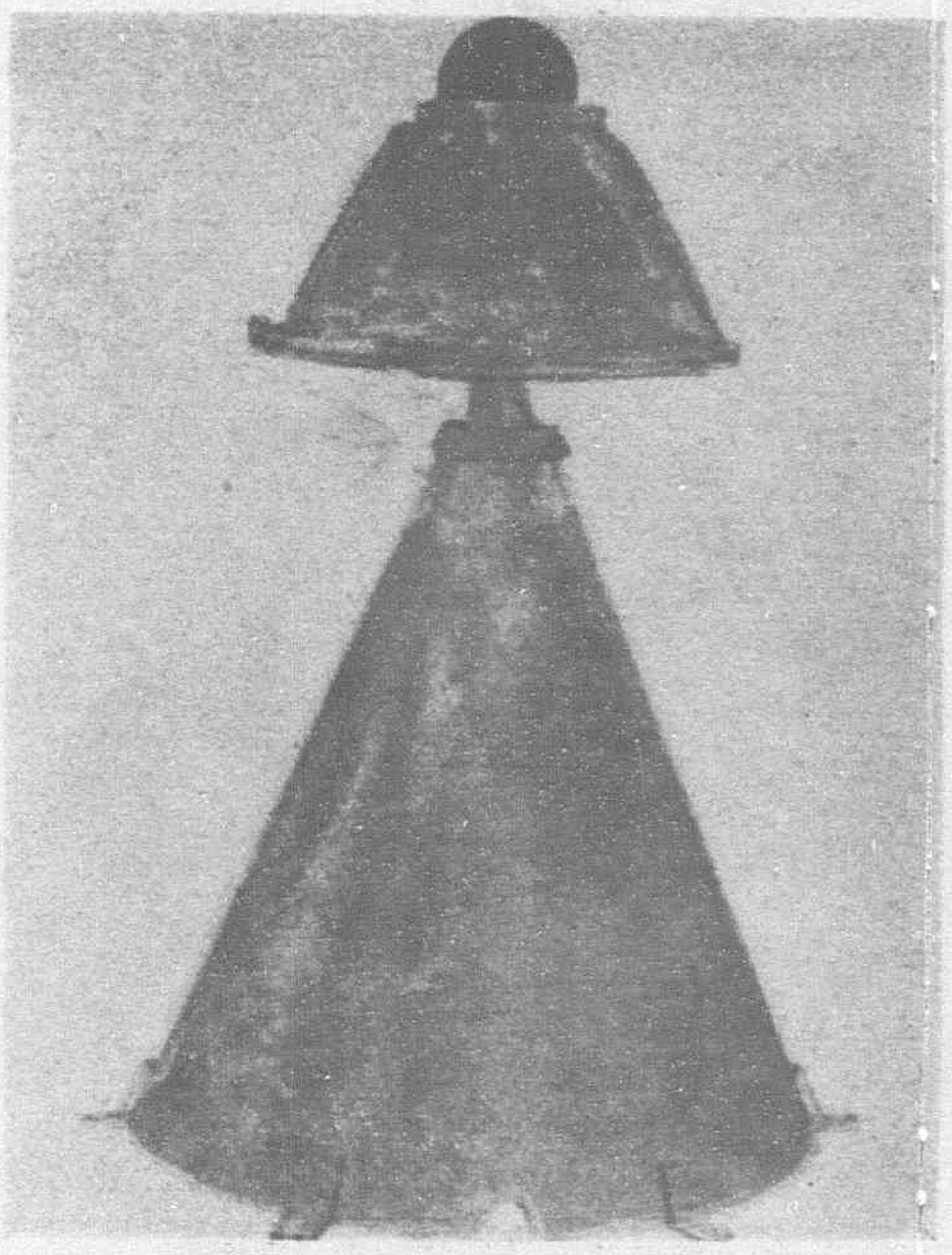


Fig. 6—Channel buoy light

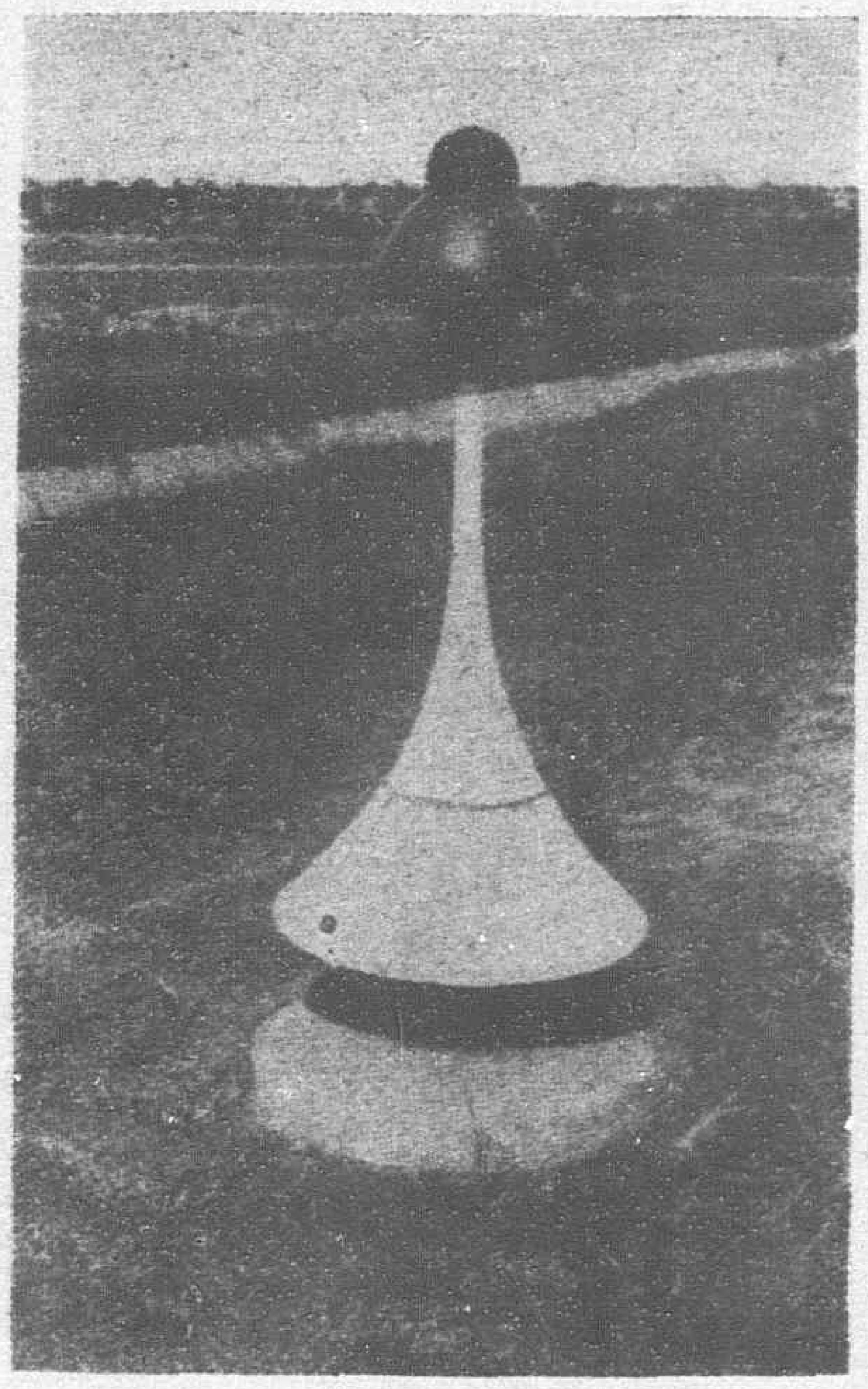


Fig. 3—Boundary light

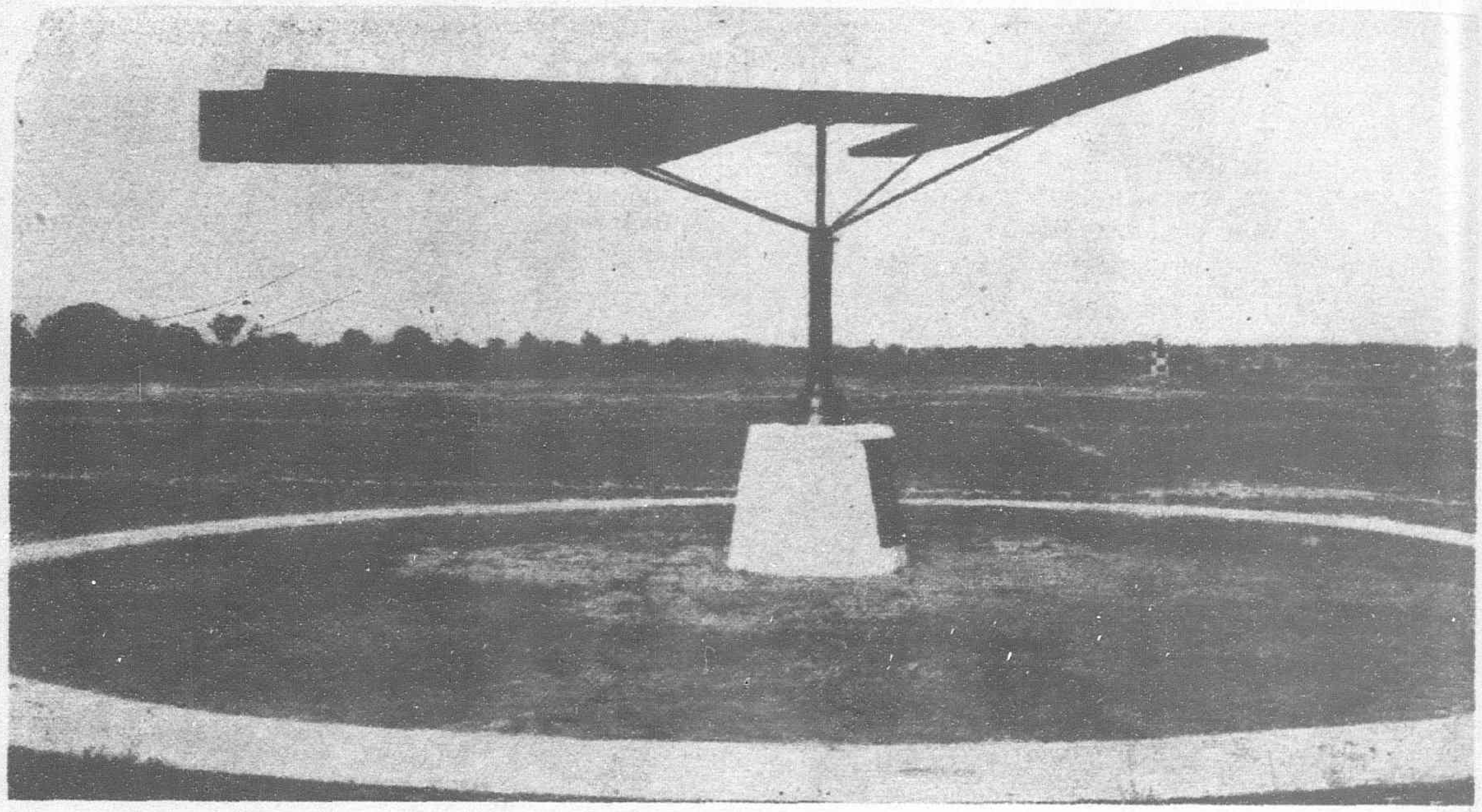


Fig. 4—Wind tee

The hand lamps are of special design and can easily be clamped to any suitable part of an aeroplane. To supplement this form of lighting there are three 200-watt Osram portable floodlights, which can be wheeled about and raised or lowered to any desired position.

Osira 400-watt lamps in dispersive reflectors, giving a high and uniform intensity, are employed for the main lighting of the hangers, and Osira 150-watt lamps in angle type reflectors and six 1,000-watt floodlights with spreader type reflectors for lighting part of the Tarmac apron.

The approach road from Geyland-road is illuminated by 400-watt Osira lamps in G.E.C. "Lewisham" lanterns, and standard guard posts are provided for assisting traffic. The side road leading to the seaplane wharf and the Royal Singapore Flying Club has cast iron Paisley standards with "Superlux" globe lanterns, each housing 75-watt Osram lamps. The Royal Singapore Flying Club is also equipped with decorative fittings. In the terminal building there are over 500-ft. of Osram architectural tubular lamps. In the main hall the indirect lighting is provided by eighty "Gecoray" reflectors. Eighteen "Internalite" signs with Osram "Striplite" lamps are used for public direction, and "Britalux" pendants have been installed in the various offices.

The General Electric Company has also supplied the loudspeaker system. The microphone is in the control tower and four loudspeakers, which carry intelligent speech over a radius of 600-ft. to 700-ft., are outside the building. While the normal undistorted power output of the equipment is 100 watts, it is capable of handling peaks up to 140 or 150 watts without distress.

The major part of the airport work was carried out by the Public Works Department. In accordance with departmental procedure, the general administration was entrusted to the Deputy Director of Public Works, a post occupied until 1935 by the present Director of Public Works and Director of Civil Aviation, Major R. L. Nunn, and subsequently by Mr. C. T. Parker, M.INST.C.E. In his absence Mr. S. J. W. Gooch, M.INST.C.E., was responsible. The seaplane channel dredging was carried out under the supervision of Mr. J. B. MacLechlan, A.M.INST.C.E., the senior Executive Rural and Marine Engineer, Mr. I. Harpur being in charge. The electrical installation work carried out by the General Electric Company, Ltd., and John Morey & Co., was under the direction of Mr. G. H. N. Reay, A.M.I.E.E. Mr. F. Dorrington Ward, F.R.I.B.A., acted as the Government Architect. Throughout the construction of the port, which occupied a period of nearly six years, Mr. R. St. George Coulfield held the position of Resident Engineer. The Airport Manager, Mr. A. Newark, is an ex-pilot in the Royal Air Force, with some twenty years' flying experiênce.

HSINKING TO HAVE AIRPLANE CONCERN

Plans are announced for establishment of Y.100,000,000 airplane manufacturing company at Hsinking under joint investment of Japan, Manchoukuo and Germany, according to *Domei* and leading Japanese newspapers.

The proposed company is to be entirely separate from the Manchuria Heavy Industry Control Company to be established by the Nissan interests with the support of the Japanese and Manchoukuo Government. *Domei* and the *Nichi Nichi* report, because it will be a special international company.

It is reported that Japan will invest Y.40,000,000 and Manchoukuo and Germany Y.300,000,000 each. The matter is said to have received already the understanding of the respective Governments.

The concern will be called the Oriental Aviation Industry Company, Ltd. Preparations offices have been set up in the Railway Hotel, Marunouchi, Tokyo, by the promoters, among whom the leaders are reported to be Mr. Teijiro Yamamoto, former Agriculture and Forestry Minister; Dr. Mannosuke Kamiyama, member of the House of Peers; Lieutenant-General Yoshitsugu Tatekawa, retired; Mr. Shingo Tsuda, president of the Kanegafuchi Spinning Company; Mr. Yakichi Ataka, president of the Osaka Chamber of Commerce and Industry. All of these men are said to be well known as nationalists.

Manufacture and sale of airplanes of various types, their parts, combustion engines and their parts will be undertaken by the company, using materials available in Manchoukuo. Shareholders will be limited to subjects of the three countries. The concern, which will have its office in Tokyo, will be managed by a president, two vice-presidents, four directors and three auditors.

The capitalization of Y.100,000,000 will consist of 2,000,000 shares of Y.50 each. A quarter of the capitalization is to be paid up when the concern is established. The company will be authorized to issue debentures for twice the amount of its paid-up capitalization.

Terms to be Five Years

If the company is not able to pay an annual dividend of more than six per cent it will not pay dividends on the shares held by the Manchoukuo Government. If the company is not able to pay an annual dividend of more than five per cent the Manchoukuo Government will provide the money necessary to bring the dividend to five per cent.

However, if the annual dividend rate exceeds six per cent the excess shall be applied to dividends on the Manchoukuo Government's shares, according to the plan announced recently.

The Dredger "Chien She"

Notable Craft Acquired Two Years Ago by Whangpoo Conservancy Board, Taken by Japanese Naval Forces in Shanghai Warfare

By HERBERT CHATLEY, D.Sc., M.Inst.C.E., Engineer-in-Chief

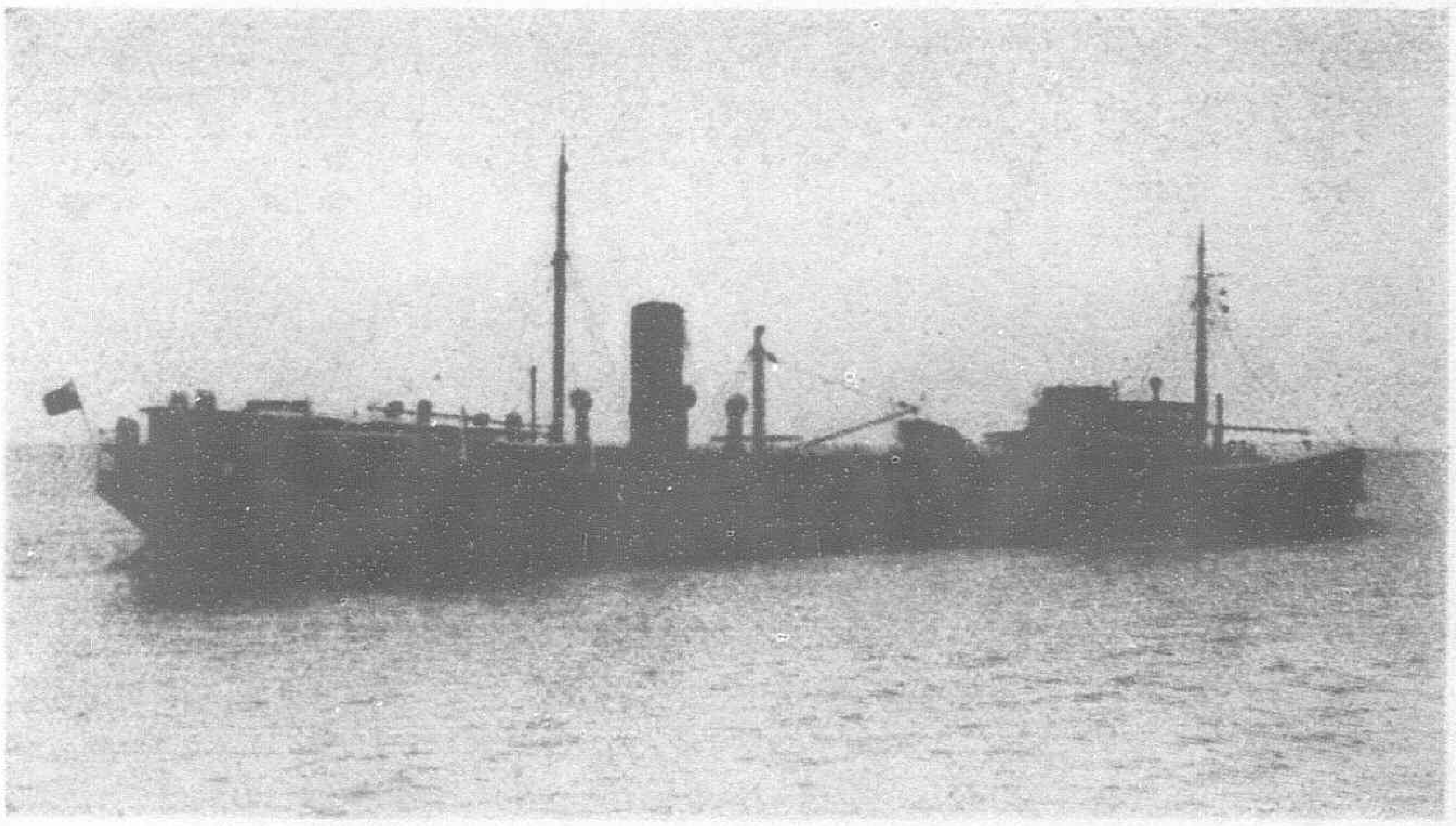
Among the Chinese craft captured by Japanese naval units in the course of the recent hostilities at Shanghai is the powerful new dredger Chien She, which was bought two years ago from F. Schichau of Danzig for the Whangpoo Conservancy Board, for service in dredging a channel through the bar at the mouth of the Yangtze river. This dredger is one of the most notable craft of its kind in the world and following other descriptive reports regarding it, which have appeared in this journal, of special interest at this time is an article devoted to the Chien She written by Dr. Herbert Chatley, who for many years held the post of Engineer-in-Chief of the Whangpoo Conservancy Board, having but recently retired from this position. Dr. Chatley's article is reprinted here from The Dock and Harbor Authority in which it originally appeared in August, 1937, the month in which the warfare at Shanghai began.

* * *

ON February 9, 1935, there sailed from Danzig the new twin-screw steam drag suction dredger *Chien She*, built to the order of the Whangpoo Conservancy Board, Shanghai, by F. Schichau, G.m.b.H., at their Danzig yard; the machinery and dredging equipment having been constructed at their works in Elbing, Germany.

The voyage to Shanghai, conducted under the most economical steaming conditions, to obviate rebunkering, was accomplished in 64 days, and after completing a very extensive series of dredging output trials, which were successfully carried out with an ample margin, she was handed over to her owners on July 4, 1935.

Since the *Chien She* was commissioned for service on the Yangtze Bar the guarantee period has elapsed, and a description of the vessel and analysis of the actual dredging work accomplished during that period is of considerable interest.



The dredger "Chien She" at Yangtze bar

The principal dimensions and other important particulars of the *Chien She* are given in the following table, as follows:

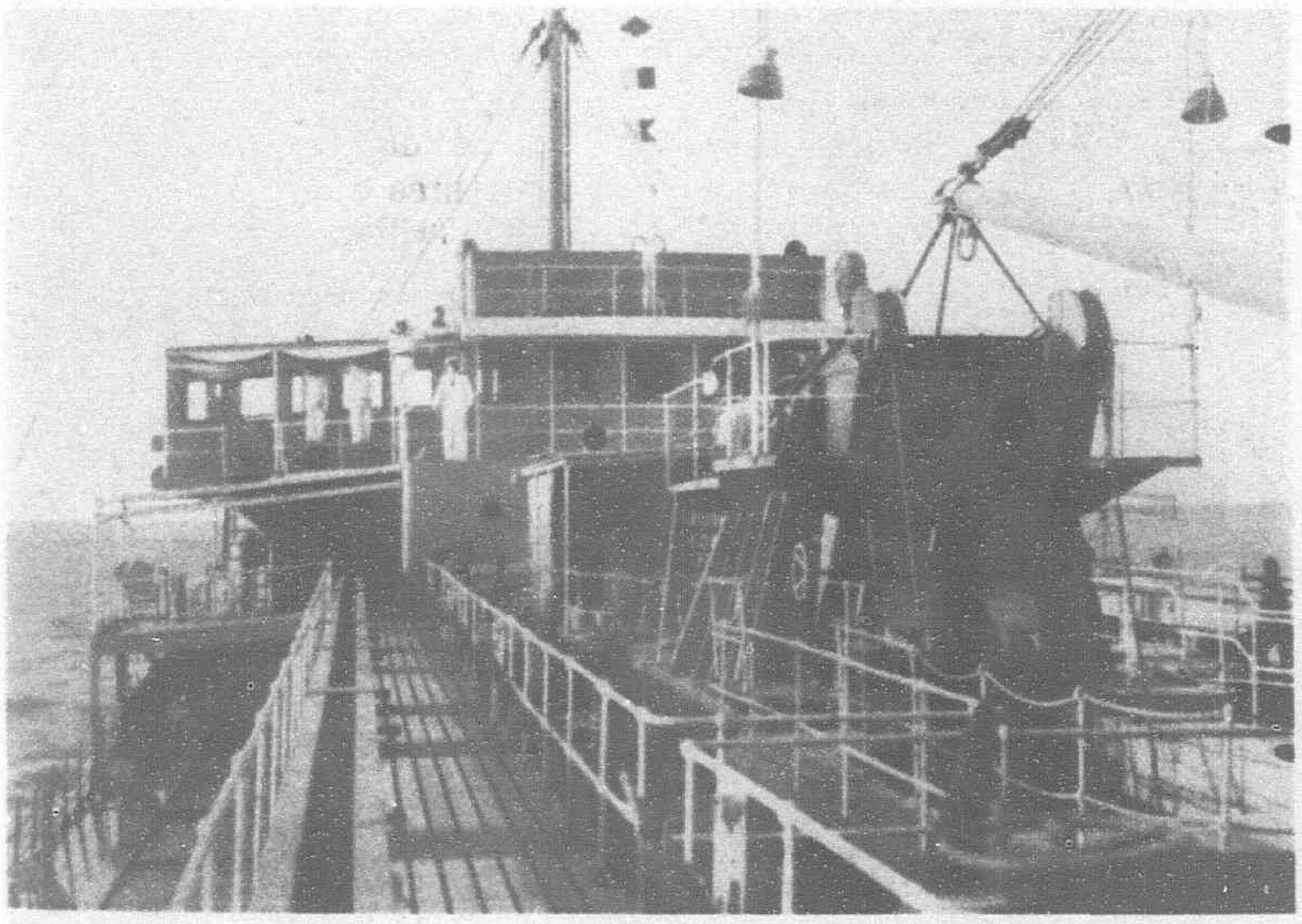
Particulars	*English*	*Metric*
Length overall	373-ft.	113.690 m.
Length B.P.	360-ft.	109.726 m.
Breadth, moulded..	60-ft.	18.288 m.
Depth, moulded	26-ft. 6-in.	8.077 m.
Gross Tonnage	4,699 tons	4,774 tonnes
Net Tonnage	1,858 tons	1,887 tonnes
Load draught, normal	18-ft.	5.486 m.
Deadweight tons	4,500	4,572 tonnes
Hopper capacity, cubic yards, to top of coaming	4,200	3,210 cub. m.
Hopper capacity, cubic yards, to deck level ..	3,700	2,828 cub. m.
Maximum dredging depth	45-ft.	13.615 m.
Dredging output of solid *in situ* mud from the Yangtze Bar of density 1.8 metric tons per cubic meter, dredged, transported in hoppers, deposited by hopper doors two sea miles distant from dredging base in a total of 10 working hours	25,000 cub. yards	19,110 cubic meters

The vessel has been built in accordance with the requirements of Lloyd's Register of Shipping under Special Survey, the classifications *100 A.1. Hopper Dredger having been assigned by that authority. The regulations of the Board of Trade have also been fully complied with.

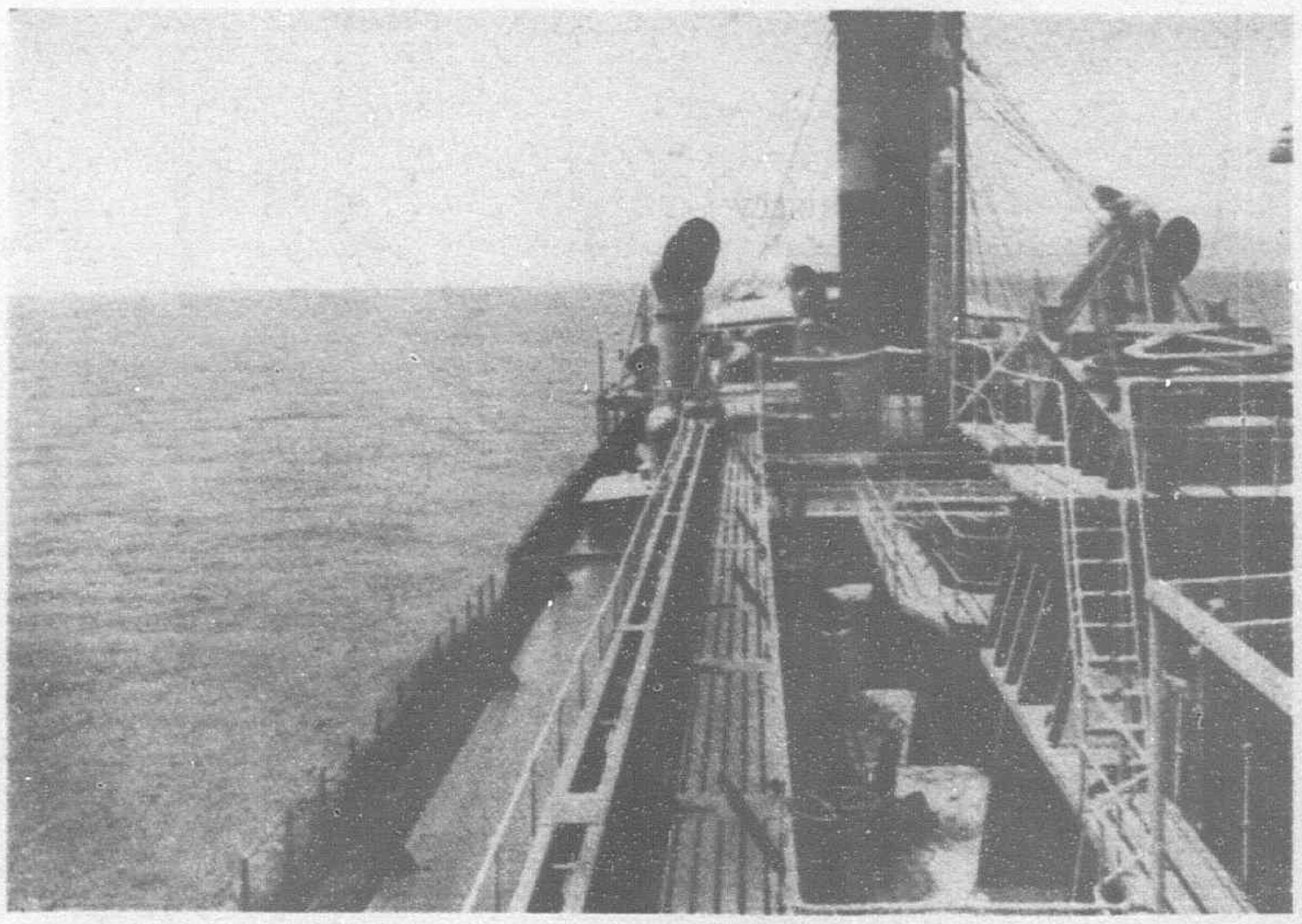
General Arrangement

The photograph of the dredger *Chien She*, illustrates the vessel in service condition, which to all outward appearance resembles that of a modern cargo steamer rather than a typical drag suction dredger.

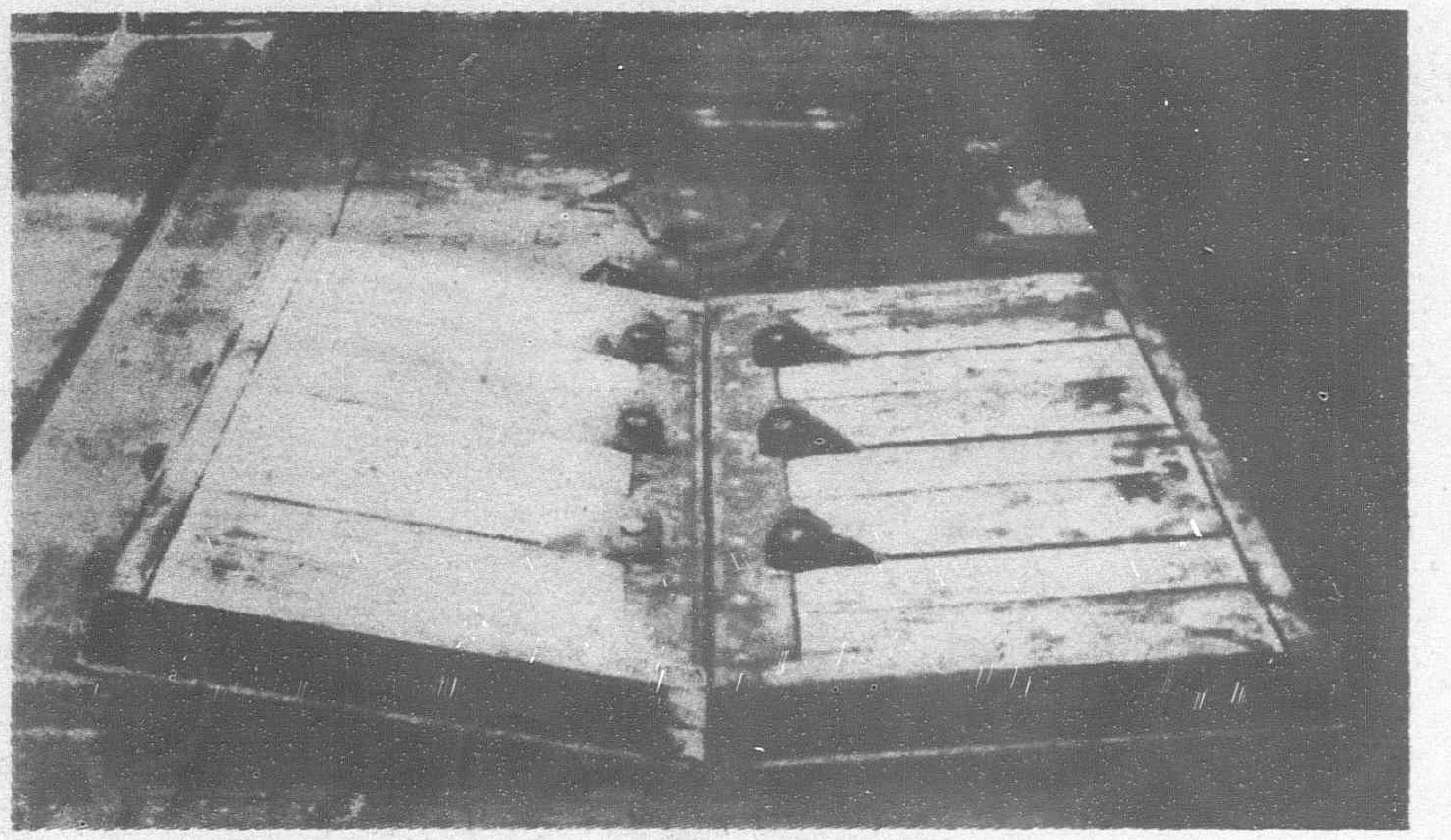
The vessel has a raked stem of rounded plate form, and elliptical stern, a single funnel and two tall masts. The rudder is of double plate type of stream-lined design and electrically welded construction; the steel castings having been supplied by the Builders' Steel Works at Elbing, who



General view of dredger looking forward



General view of dredger looking aft



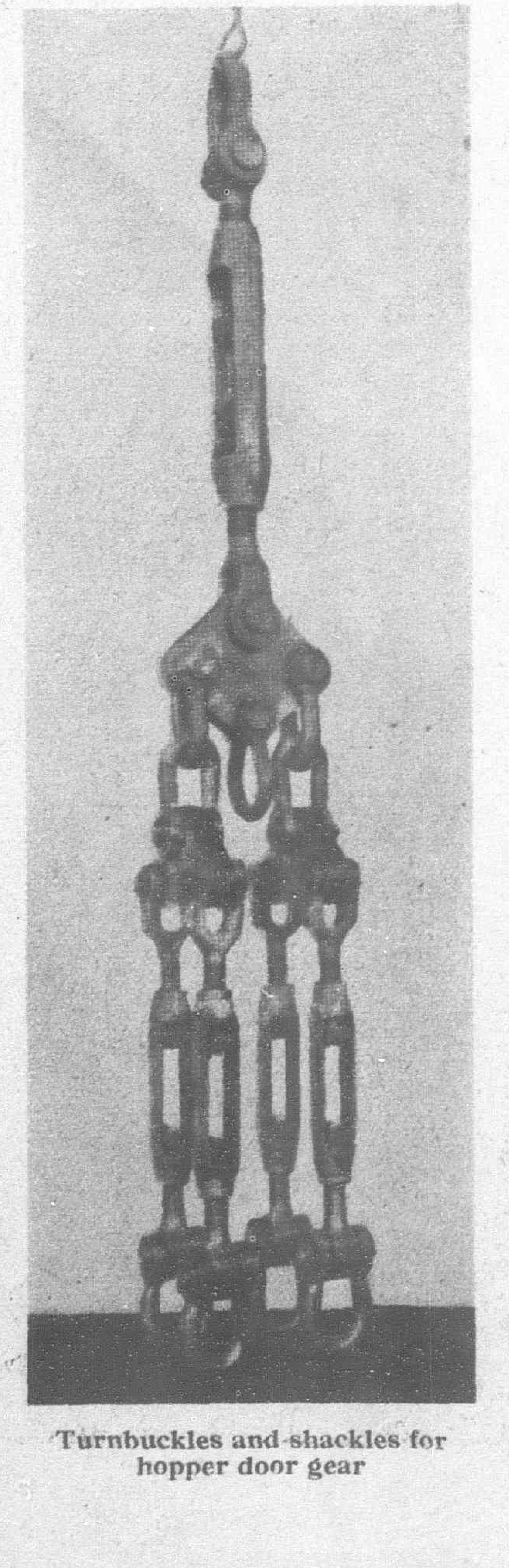
A pair of hopper bottom doors

also manufactured the stern frame and shaft brackets. The hull plating is bossed in way of the two lines of shafting, and extends aft to the propellers.

Closer views of the vessel, looking forward and aft, are also shown.

Watertight sub-division is effected by six transverse bulkheads, all of which extend to the level of the main deck, with the exception of the bulkheads at the fore and after ends of the hopper spaces, which are carried up to the upper deck. The vessel is further subdivided longitudinally by a center well amidships, in which the suction pipe and dredging ladder is situated. Forward of the well is an additional watertight compartment through which the suction pipe passes to the dredging pump. This compartment is provided in case of damage to the well during dredging, and also contains the hydraulically-operated main sea suction, shut-off valve.

On either side of the center well is arranged the spoil hoppers, constructed with sloping sides, which form large buoyancy spaces at the ships' side and center well sides respectively. The outer spaces have extra deep floors plated over and arranged as feed water tanks, built with recesses in way of the sea suction valves to hoppers; the tank top plating and connection to ship and hopper sides being of welded construction. The spaces at the center well side are utilized for the installation of the main suction pipes and valves from the hoppers.



Turnbuckles and shackles for hopper door gear

The peak tanks have a large capacity arranged for trimming purposes. A summary of the capacities of the various fuel bunkers and tanks for fresh water and water ballast is given below :—

			Tons
BUNKERS :—			
Cross bunkers	oil fuel, 6,740 cub. ft	Coal, 6,460	145
Starboard bunker	,, 12,050	,, ,, 10,300	228
Port bunker	,, 12,350	,, ,, 10,510	232
Settling tanks	,, 1,000		—
		Total Coal Capacity	605
FRESH WATER :—			
Feed water tanks, port			127
Feed water tanks, starboard			127
Drinking water tanks			18
		Total fresh water	272
WATER BALLAST :—			
After peak			154
Fore peak			156
		Total water ballast	310

A large cargo hold is arranged forward for the storage of wire ropes, stores, and spare dredging equipment; aft of which is the pumping engine room, the hopper spaces, boiler room and propelling engine room respectively, whilst an insulated and refrigerated chamber, having a storage space of 600 cu. ft. in three compartments, is situated in the 'tween deck aft.

Accommodation for Officers and Crew

The accommodation for the captain and dredging master, first officer, and chief engineer, is arranged below the bridge deck, together with wireless room and office. On the main deck aft six additional cabins are provided for the deck and engine-room officers. The cabins are unusually large, well ventilated and comfortably fitted out for the tropical weather conditions under which the dredger has to work during the summer months. The steel decks forward and aft in way of all accommodation are sheathed with teakwood planking.

Cabins for the Chinese senior ratings, including: dredging laodahs, wireless operator, engine-room artificers and armed guards are arranged forward, at the port and starboard sides of the pump room casing. In the 'tween deck forward, light and airy accommodation is provided in four separate spaces for sailors, oilers, firemen, cooks and boys, fitted up with steel-frame berths, lockers, and tables. The forecastle deck is of teakwood, and the 'tween decks in way of crews' space of Oregon pine.

Well-fitted bath rooms and toilet facilities are arranged in conjunction with officers' and senior ratings' accommodation, whilst spacious toilet room, lavatories, and wash-houses, are provided for the use of the crew.

On the poop deck aft is situated a suite of three state rooms, with bath room and toilet adjoining for accommodation of the Board's officials and dredging engineer during inspection visits to the dredger.

The full complement of the vessel is as ollows :—

	Persons
Captain and dredging master, and deck officers	4
Chief engineer and engineer officers	5
Chinese senior deck ratings and medical officer	15
Chinese senior engine room ratings	13
Sailors 18, oilers 7, firemen 20	45
Steward 1, cooks 6, boys 7	14
Other non-ratings	10
Total	106

Navigating Equipment

The outfit of magnetic compasses has been supplied by Messrs. Kelvin, Bottomley and Baird, Ltd., of Glasgow, and comprises two of this firm's "Kelvite" pattern liquid card instruments, supported on a solid teak pillar with patent suspension.

As previously mentioned, a British Admiralty silent magneto-striction, echo sounder with recorder, supplied by Henry Hughes & Son, Ltd., is installed for taking soundings over the dredging area.

Messrs. Siemens have supplied the installation of loud-speaking telephones communicating between the navigating bridge and the steering position on the poop deck, and between the propelling and pumping engine rooms, all interconnected. The same firm has also installed an electric indicator for the ship's navigating lights and dredging signals.

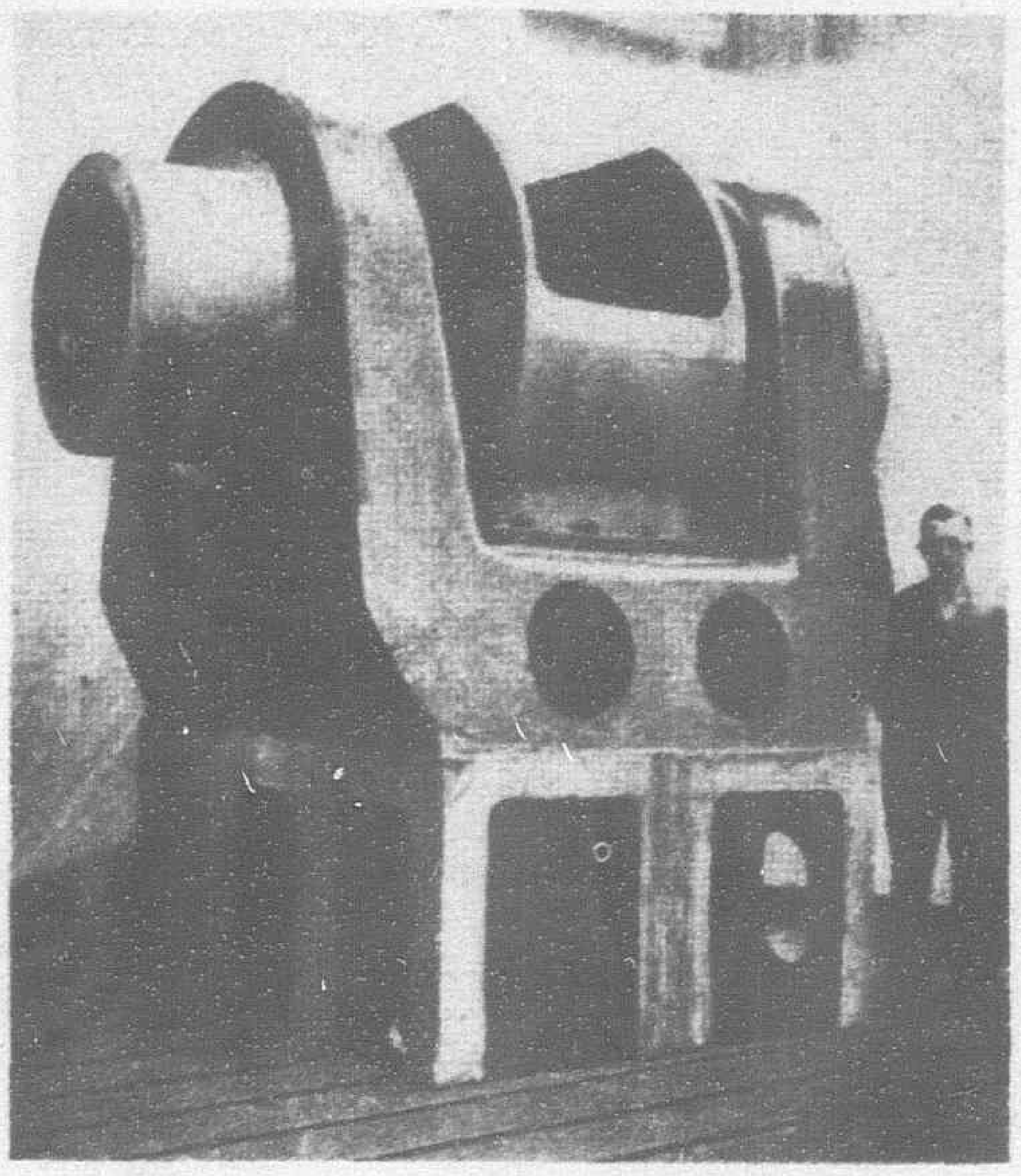
A "Teledep" draught and displacement instrument supplied by Messrs. Dobbie McInnes & Co., Glasgow, is installed in the operating room for indicating the conditions of loading in the hoppers during dredging.

Dredging Arrangements and Equipment

The main hoppers, which are situated on either side of the center well, amidships, have an aggregate capacity of 2,850 cu. meters (3,700 cu. yds.) to deck level. The hoppers are constructed with sloping sides, with cross girders at bottom, which divides each hopper space into ten compartments, open at the bottom, and closed by means of a double row of steel cased doors lined with oak wood. The doors are supported on strong forged-steel hinges, fitted with manganese steel pins and bushes, and when closed press against oak wood frames lined with leather jointing. Each door is raised by two steel-wire strops, fitted with stretching screws, and connected to equalizing gear in order to ensure equal loads on all the supports.

Each pair of door wires is further connected to a second equalizing gear, to which is attached the main chains leading to a sliding motion girder running along continuous gangways on the hopper tops. The sliding girder for opening and closing the hopper doors is actuated by means of a hydraulic ram situated one on either side at the after end of the hopper gangways. The rams are arranged to work at a pressure of 600 lb. per sq. inch.

This arrangement makes it possible to operate each pair of doors separately, or any number of them together.


Sliding joint and trunnions of suction ladder

During loading of the hoppers the main-door chains are supported by means of a forged steel cottar secured to a cast steel stool on the hopper gangway, which also forms the sliding faces for the hydraulic motion bar.

Perhaps the most interesting part of the whole dredging gear is the dredging head, or drag head, and the outboard suction pipe for conveyance of the dredged material to the pump. The utmost care has been taken in the design of this equipment in order to reduce to a minimum friction losses at the drag-head entrance and in the suction pipe, and with this object in view the various parts and sections have been made of stream-line form.

The suction pipe is arranged in a strong girder frame of steel plate and angle construction, secured to massive steel castings at either end; the lower casting being arranged with bearings and shaft to take the drag head, the upper casting having side journals of large diameter, which are supported in heavy bearings secured to the center well sides. Attached to the upper casting is a cast steel machined sliding joint, which rotates in a steel casting secured to the forward end of the center well plating, the joint being made watertight where the sleeve passes through the hull, and connects to the main suction pipe to the dredging pump.

The dredging pump has been kept as low as possible, in order to reduce the suction lift.

The lower part of the outboard suction is fitted with an interchangeable cast steel suction drag head of massive design and construction, fitted at the entrance with manganese steel cutting blades, and having vertical grid plates for the purpose of excluding large objects and wreckage from entering the pump. Three different sizes of drag heads have been supplied, measuring six, eight and ten feet respectively on the cutting edge, one of which is illustrated. The inner surfaces are streamlined throughout, and the head is cast with a water jacket fitted with pressure water jet openings facing in the direction of flow of the spoil, which can be used to provide water lubrication on the inner skin of the casting when dredging stiff materials.

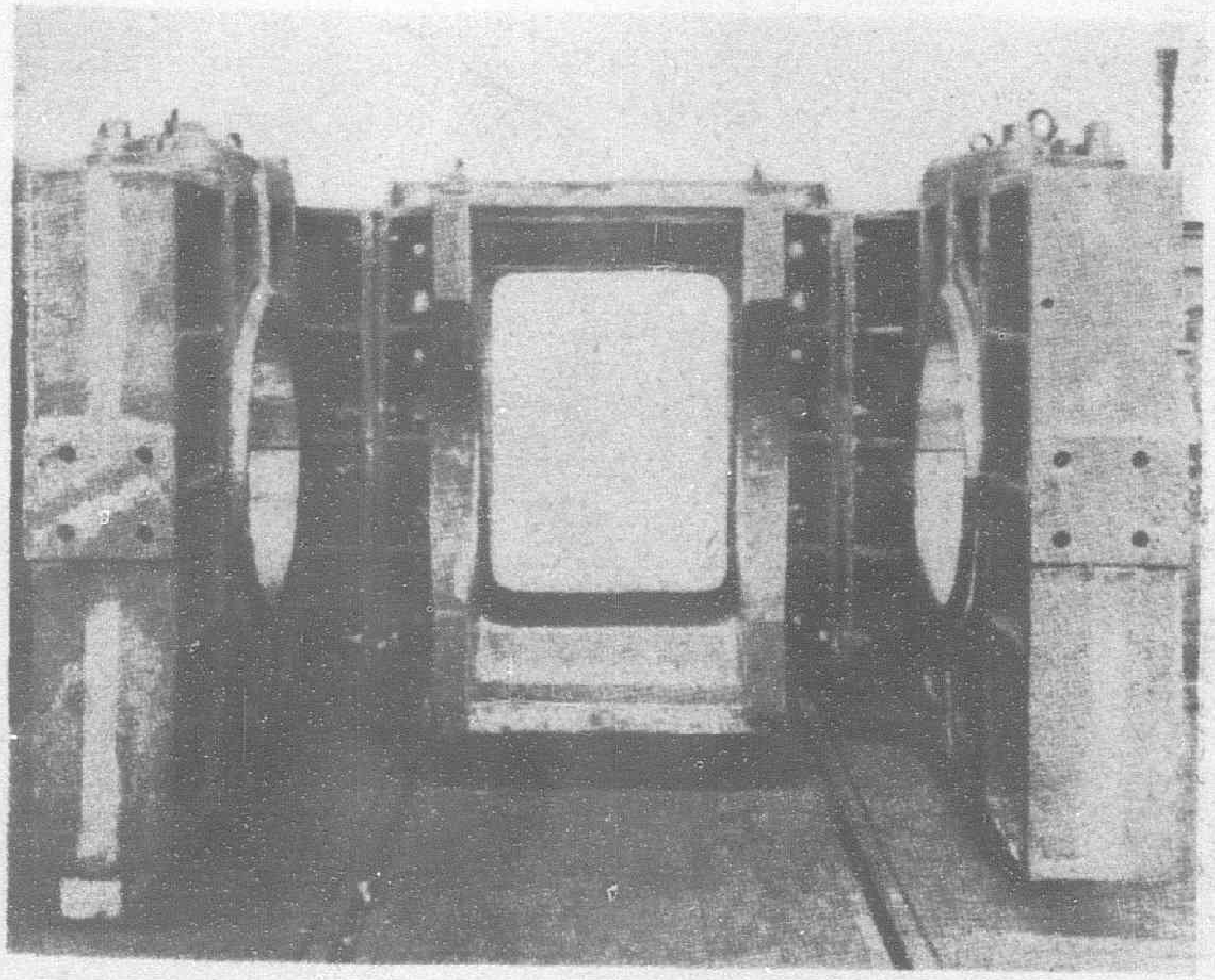
Another interesting and important feature of the drag head is the mechanism for maintaining a constant angle at the cutting edge of head irrespective of dredging depth, tidal variation or loaded conditions of the dredger.

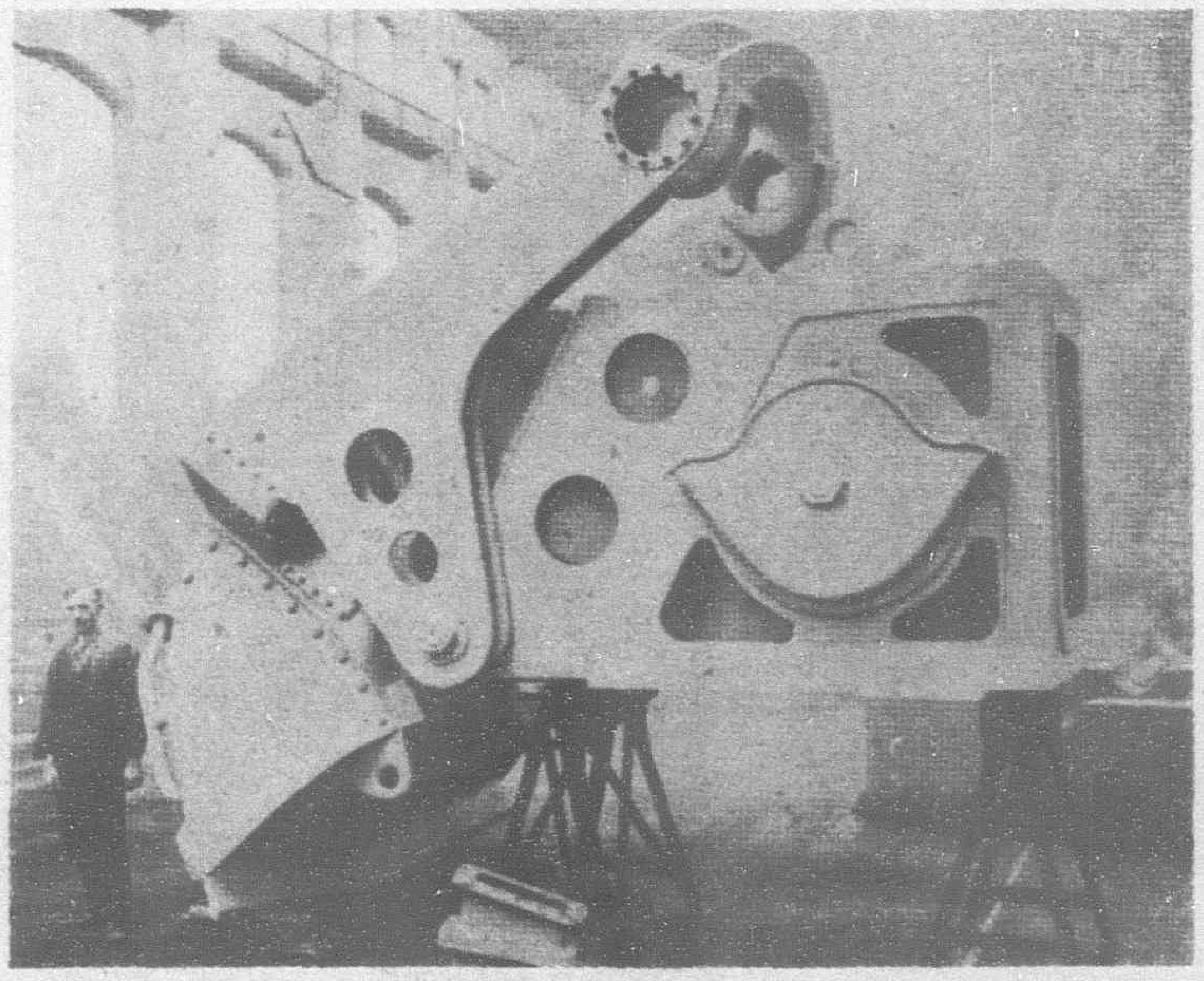
This arrangement, which is shown in the illustration, consists of two cast steel, lever-shaped arms, mounted on top of the drag head, connected at the upper end to a branch piece, the ends of which form a journal rotating in the lever ends. These side arms are cast hollow, and serve to convey the pressure water service to the water jacket in the drag head. The branch piece joins a "Mannesman" solid drawn steel pressure water pipe, which in turn is connected to a second cast steel branch piece mounted on bearings secured to the forward end of the center well. By means of this mechanism, the cutting angle of the drag head, after having been set to suit the conditions of dredging remains fixed for any position of the head, the variation of angle being taken up by a sliding sleeve secured to the upper part of the drag head. A general view of the suction ladder with drag head attached is shown.

The suction ladder is housed within the center well, and has heavy wood-faced fenders on both sides, which bear on doubling plates on the well sides during dredging. The lower end of the suction pipe and ladder is suspended from the hoisting platform by steel wire ropes, raised and lowered by means of the hoisting winch already described. A view of the center well and suction ladder is shown, showing the drag head in the top position.

The main dredging pump is of the centrifugal type, built of cast steel sections bolted together and lined internally with manganese-steel wearing plates. The impeller is of the semi-shrouded type 8-ft. 6-in. diameter over tips, having four mild steel blades, 20-in. in width, riveted to vanes cast on to the impeller disc. The impeller shaft is $13\frac{3}{4}$-in. diameter at the bearing, and connects through a "Michell" type thrust block to the main pumping engine. The impeller shaft bearing is fitted with a patent sand excluding device, to which a supply of clean water under pressure is kept in circulation.

The pump and impeller has a water-pumping rate of 18,000 tons per hour at a speed of 120 revolutions per minute when delivering through the distributors at the hopper tops, and when dredging thick mud, having an *in situ* density of 1.8, the pump can fill the


Side bearings and opening for suction sliding joint


Side view of draghead showing side levers for angle control

hoppers with a load of 4,000 tons in less than 20 minutes.

The arrangement of suction and delivery piping and valves makes it possible to draw the dredged-up material from the drag head and deliver it direct to the hoppers, or if required, it may be pumped overboard for reclamation purposes. It also permits of the hoppers being pumped out and discharged overboard.

Each particular method of pumping is controlled by manœuvring appropriate sluice valves in the suction and discharge pipes, all of which are hydraulically operated by control levers, arranged in the operating room on the bridge deck. The main discharge pipe from the pump is divided at the main deck level into two separate discharge pipes leading to the port and starboard hoppers respectively, each having five outlets or distributors spaced at intervals along the length of the hopper and fitted with a hydraulically-operated sluice valve for control of the loading, and to ensure an equal distribution of the load in the hoppers.

Particulars of the various suction and discharge connections are given in the following Table :—

		Dimensions	
Description	*Number*	*Millimeter*	*Inches*
Maximum opening at entrance to 8-ft. draghead	—	2,400 × 900	96-in. × 35½-in.
Suction opening in draghead crown ..	1	1,100 × 900	43⅜-in. × 35½-in.
Section of Outboard suction pipe ..	1	1,200 × 800	47¼-in. × 31½-in.
			Diameter
Main dredging pump suction	1	1,100	43⅜-in.
Pump suction branches from hoppers .	2	700	27½-in.
Pump suction from sea	2	300	11¾-in.
Mixing water sea valves	10	560	22-in.
Main dredging pump discharge ..	1	1,000	39⅜-in.
Overboard discharge pipes	2	1,000	39⅜-in.
Discharge pipes to hoppers	2	700	27½-in.
Discharge outlets to hoppers	10	450 × 586	17¾-in. × 23-in.
Pressure water pump sea suction ..	1	450	17¾-in.
Pressure water pump discharge ..	1	400	15¾-in.
Pressure water connection to doors ..	1	100	4-in.
Clear openings in bottom for dumping	10	2,060 × 2,230	81-in. × 88-in.

Independent sea inlets, each fitted with hydraulically-operated sluice valves, are arranged, five on each side of the vessel, with short inlet pipes leading to the lower compartments of the hoppers. These inlets are placed directly opposite the suction openings from the hoppers, and are used for diluting the hopper mixture when the load is being pumped overboard from the hoppers.

A double-stage centrifugal pump, having both chambers working in series constructed by the builders, is installed in the pumping engine room for the supply of high-pressure water to the drag head water jets, and also to the bottom door frames for cleaning the joints after the spoil has been dumped.

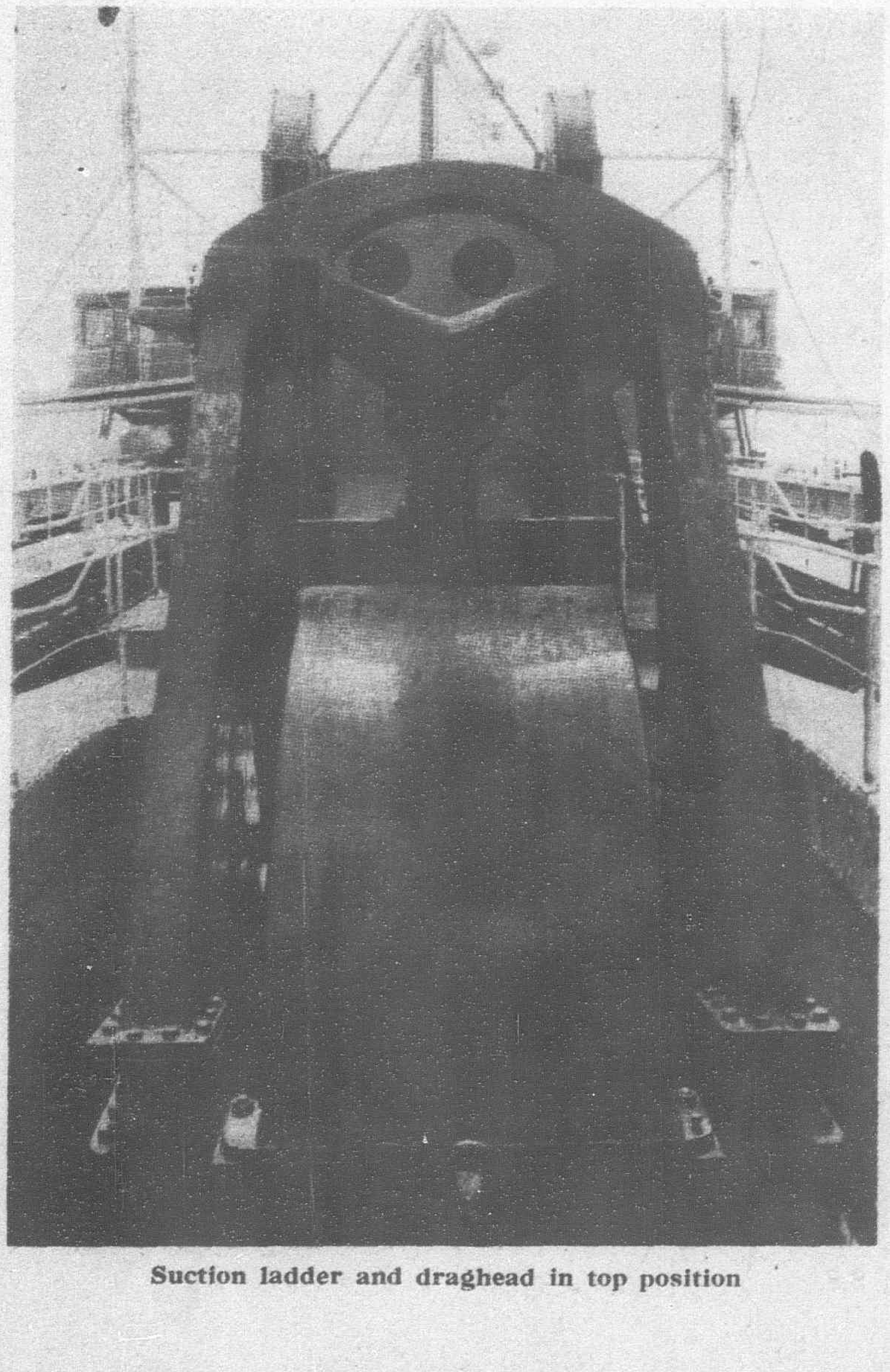
The pump has a capacity of 2,500 gallons per minute against a head of 150-ft., or 6,000 gallons at 30-ft. head, and is driven direct by a set of vertical compound, enclosed type, engines developing 290 i.h.p. at 325 revs. per minute.

Two steam-driven hydraulic pumps are also installed for providing the necessary high-pressure water supply to the various hydraulic rams and sluice valves in connection with dredging equipment. The pumps are of the vertical duplex, long-stroke type, arranged to work at a water pressure of 750 lb. per sq. inch, the door rams being operated at about 600 lb. per sq. inch, and the individual sluice valves at a reduced pressure of 250 to 300 lbs. per sq. inch. The pumps are fitted with regulator controls on the steam and water ends of the system.

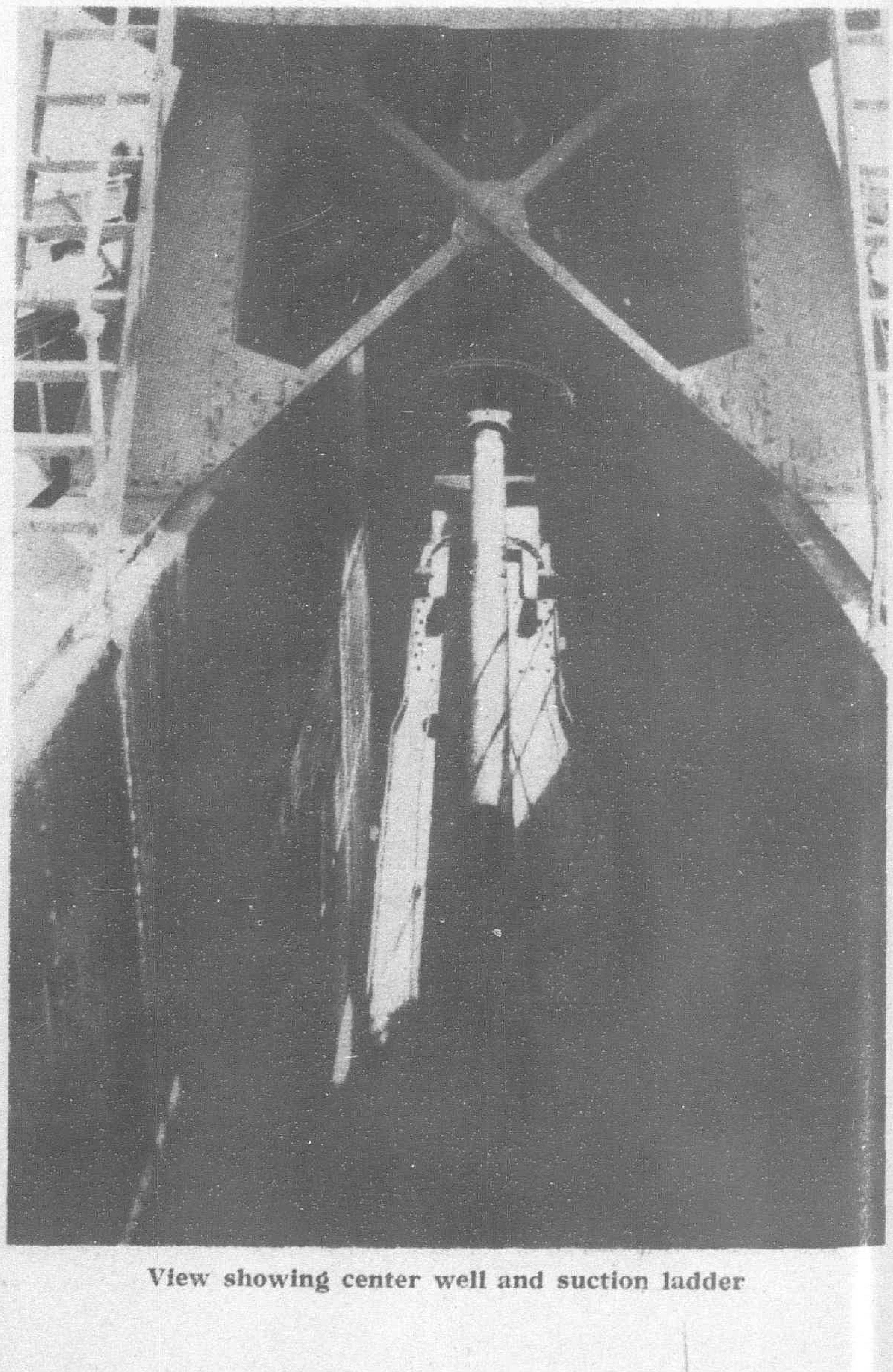
Pumping Machinery

The main dredging pump is driven direct by a single vertical triple expansion, marine-type steam engine having cylinders 500 m/m.—820 m/m—1,350 m/m. diameter respectively, by 950 m/m. stroke (19 11/16-in. 32¼-in.-51 3/16-in. by 37⅜-in.) capable of developing 2,400 i.h.p. at a normal speed of 150 revs. per minute.

The engine is of substantial construction, designed for a moderate degree of super-heat, with crank shaft arranged in three



Suction ladder and draghead in top position



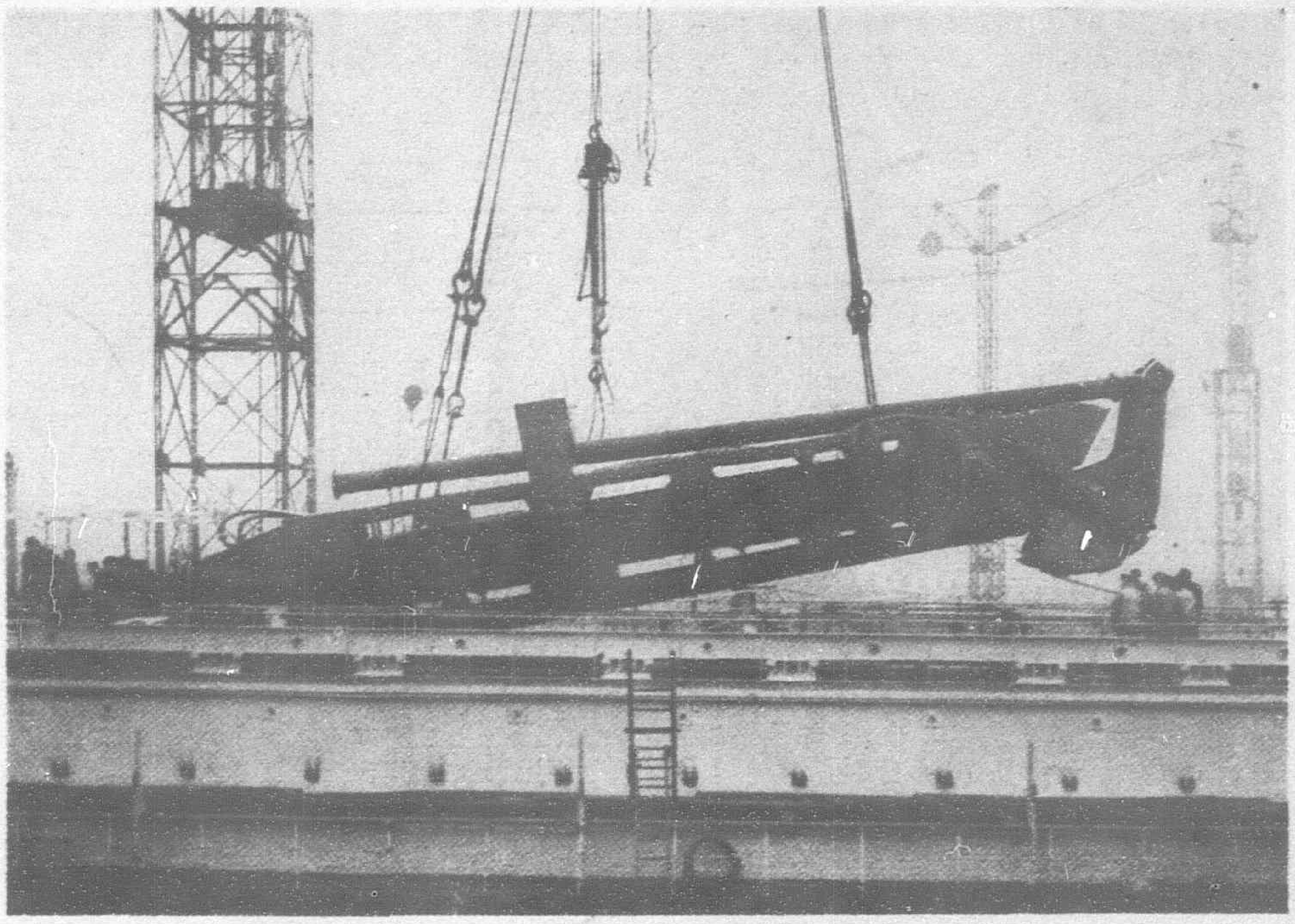
View showing center well and suction ladder interchangeable sections, ahead and astern valve motion and reversing gear, and fitted with a dead-weight sensitive governor. The pistons are fitted with Lockwood and Carlisle packing rings, and the rods with patent metallic packing. The cylinders are well insulated and entirely enclosed by portable polished steel covers.

The pumping machinery, which is installed in a separate engine room situated forward of the hopper spaces, is entirely independent from the propelling machinery, having its own condensing plant and auxiliary machinery, which can be shut down when the dredging operations are suspended.

The pump room auxiliaries are all steam driven, and comprise the following units :—

One Weir's Regenerative Condenser, 3,200 sq. ft., constructed by the builders, a "Weir's" Paragon-type air pump, a 12-in. centrifugal circulating pump, a duplex cylinder condensate pump with automatic control from filter tank ; bilge, ballast and gland pressure water pumps, and as already mentioned, the large high-pressure water jet pump and a pair of powerful duplex pumps for the hydraulic pressure system.

On the starboard side of the pump room a well-equipped workshop is arranged in a separate enclosure, over which is situated a spacious pump-room store.


General view of the suction ladder and draghead

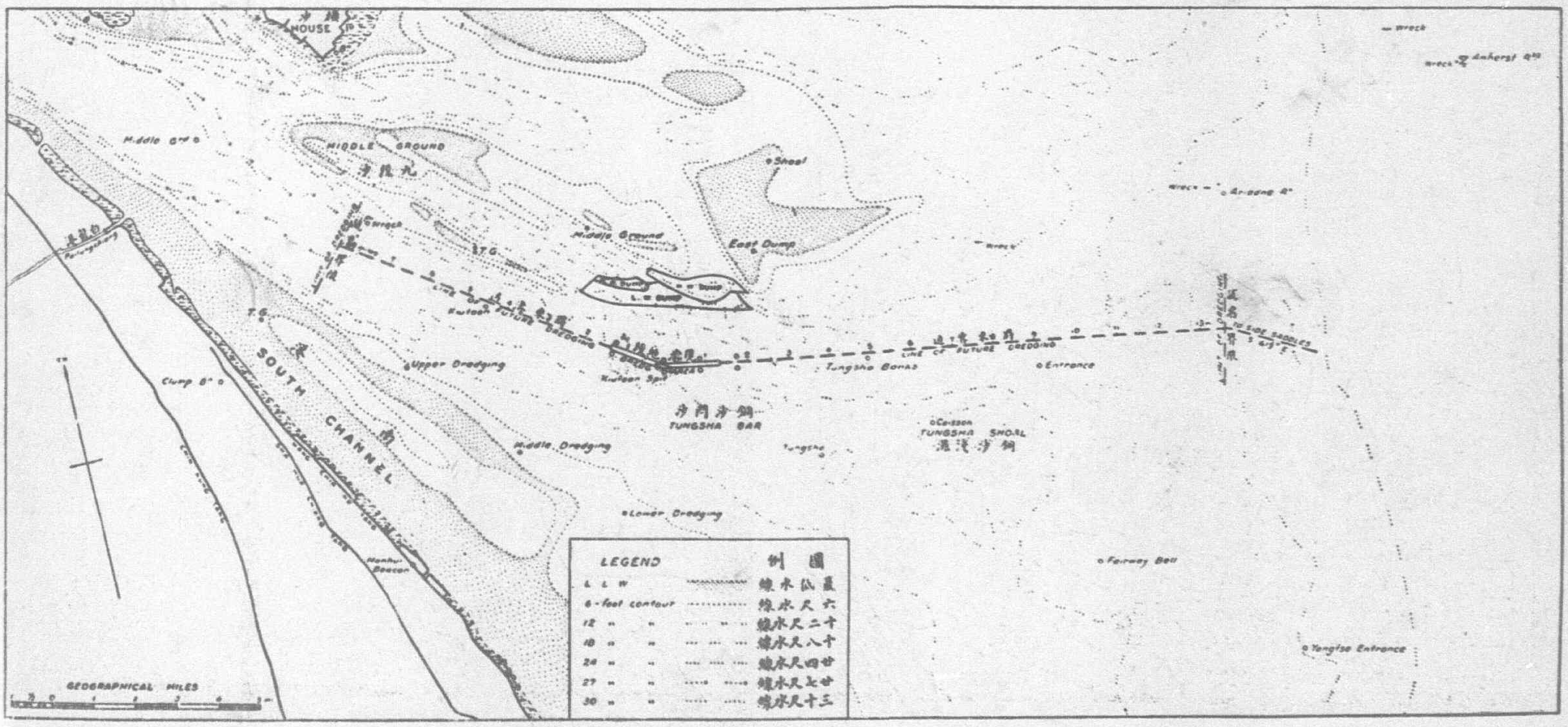
Propelling Machinery

The propelling machinery consists of twin sets of triple expansion surface condensing steam engines having cylinder 480—800—1,300 m/m. diameter by 750 m/m. stroke. (18⅞-in.-31½-in.-51 3/16-in. by 29½-in.), capable of developing a total of 3,000 i.h.p. at a normal speed of 130 revs. per minute. The working parts are designed for super-heated steam. The engines are entirely independent for propelling purposes, with crank shafts in three interchangeable sections, fitted with "Michell" type patent thrust blocks, and driving four-bladed cast-iron propellers. All the pistons are fitted with Lockwood and Carlisle packing rings, and the rods with patent metallic packing. The cylinders are well insulated and entirely enclosed on top with portable covers of planished steel sheets lined with asbestos material. The stern tube bushes are of cast iron, fitted with Vicker's type sand-excluding glands.

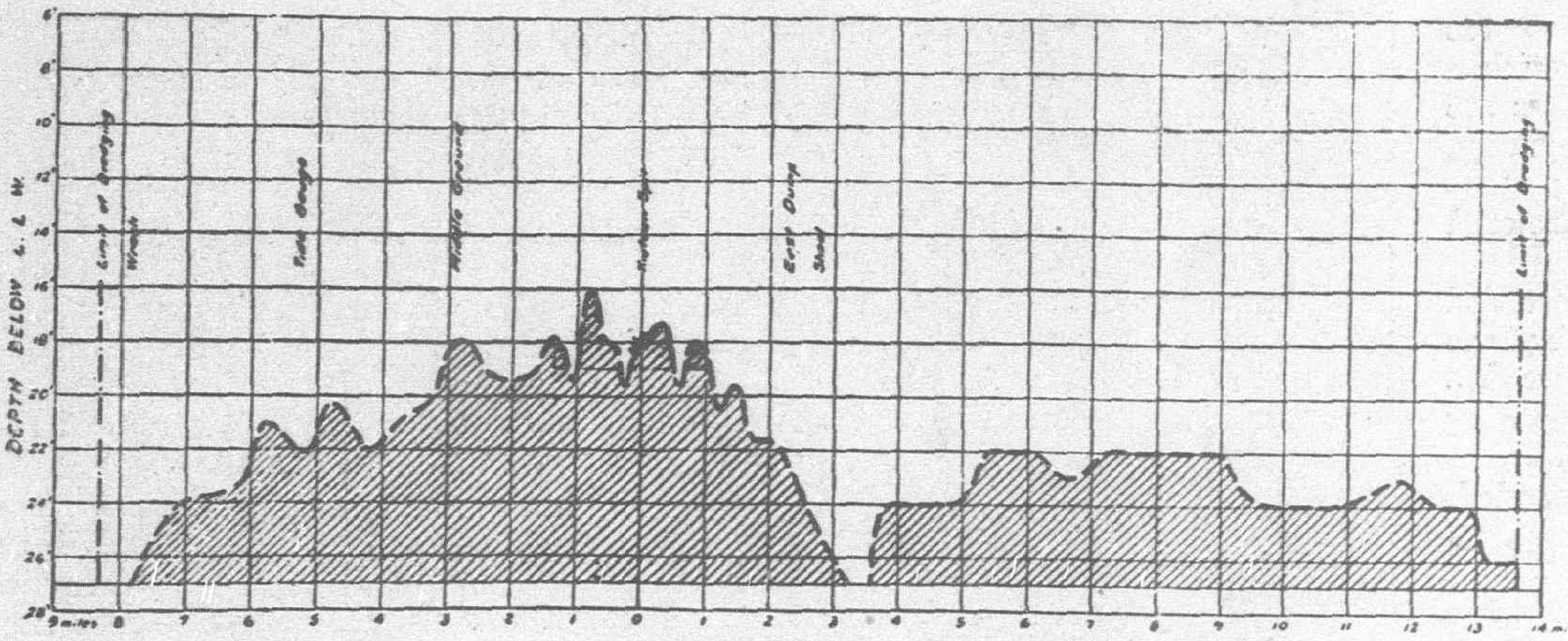
A large range of steam-driven auxiliaries is provided for the feed-water system and general service duties, including :—One Weir's regenerative-type condenser, common to both engines, having a cooling surface of 3,200 sq. ft., constructed by the builders, Weir's main and auxiliary feed pumps with automatic feed control, Weir's "Paragon" type air pump, Weir's 10-ton evaporator and fresh-water distilling apparatus, 12-inch centrifugal circulating pump ; and the usual bilge, ballast and general service pumps. In addition, an independent auxiliary condensing equipment is provided for port and stand-by use, comprising : A Weir's type condenser, "Mono-type" air pump, and a 6 in. centrifugal circulating pump.

The suction side of the feed-water system connects to a gravitation type-feed water filter of large capacity, into which the condensate water from the pumping and propelling engine room is directed, together with drains from all the main and auxiliary machinery. The feed water passes from the filter by automatic control to the main feed pumps, and is discharged through a Weir's "Multiflow" type surface-feed water heater before entering the boilers.

A No. 6 "Hall's" CO_2 refrigerating machine is installed at the after end of the engine room adjoining the insulated chambers, while two vertical compound steam-generating sets, supplied by the



Revised location of initial dredging on the Yangtze bar 1935-36



Profile of the Yangtze bar

builders, each driving a 16 kw. Siemen's dynamo, together with a 12 kw. "National,"—"Lawrence Scott" Emergency Diesel dynamo set, supplied by the National Gas and Oil Engine Co., Ltd., Ashton-under-Lyne, completes the auxiliary equipment in the propelling engine room.

Boiler Room Installation

The steam-generating equipment consists of four single-ended, cylindrical return tube, four furnace boilers, each fitted with super-heater and arranged for operating under Howden's system of forced draught in a common open stokehold, the furnace fronts being arranged for coal or oil fuel burning. The boilers, super-heaters, and fan units have been supplied by the builders from their works at Elbing, the furnace fronts by Messrs. James Howden & Sons, Ltd., Glasgow, and the oil fuel equipment by The Wallsend Slipway and Engineering Co., Ltd., Wallsend-on-Tyne.

The boilers are each 17-ft. 1-in. mean diameter by 12-ft. 11-in. mean length, constructed with a single shell plate for a working pressure of 200 lb. sq. inch. the steam being super-heated to 610° F. in order to compensate for pressure drop in the long main steam range to the forward engine room. One of the four main boilers is shown under construction, also a view of the after-stokehold.

The total heating surface of the four boilers is 13,760 sq. ft., the grate area 328 sq. ft., and the super-heater surface 540 sq. ft. Each pair of boilers is fitted with a "Ranarex" CO_2 recorder, and two "See's" ash ejectors are installed for discharging the ashes. Soot-blowing arrangements are fitted to each boiler. Under service conditions the boilers are capable of supplying steam for all purposes, under natural draught condition when burning a good quality of Chinese coal having a calorific value of about 14,000 B. T.Us per pound.

Electrical Installation

The vessel is fitted throughout by electricity, the current being supplied from the steam-generating sets installed in the propelling engine room. In addition to the deck and accommodation lights, four powerful flood lights are fitted on posts over the

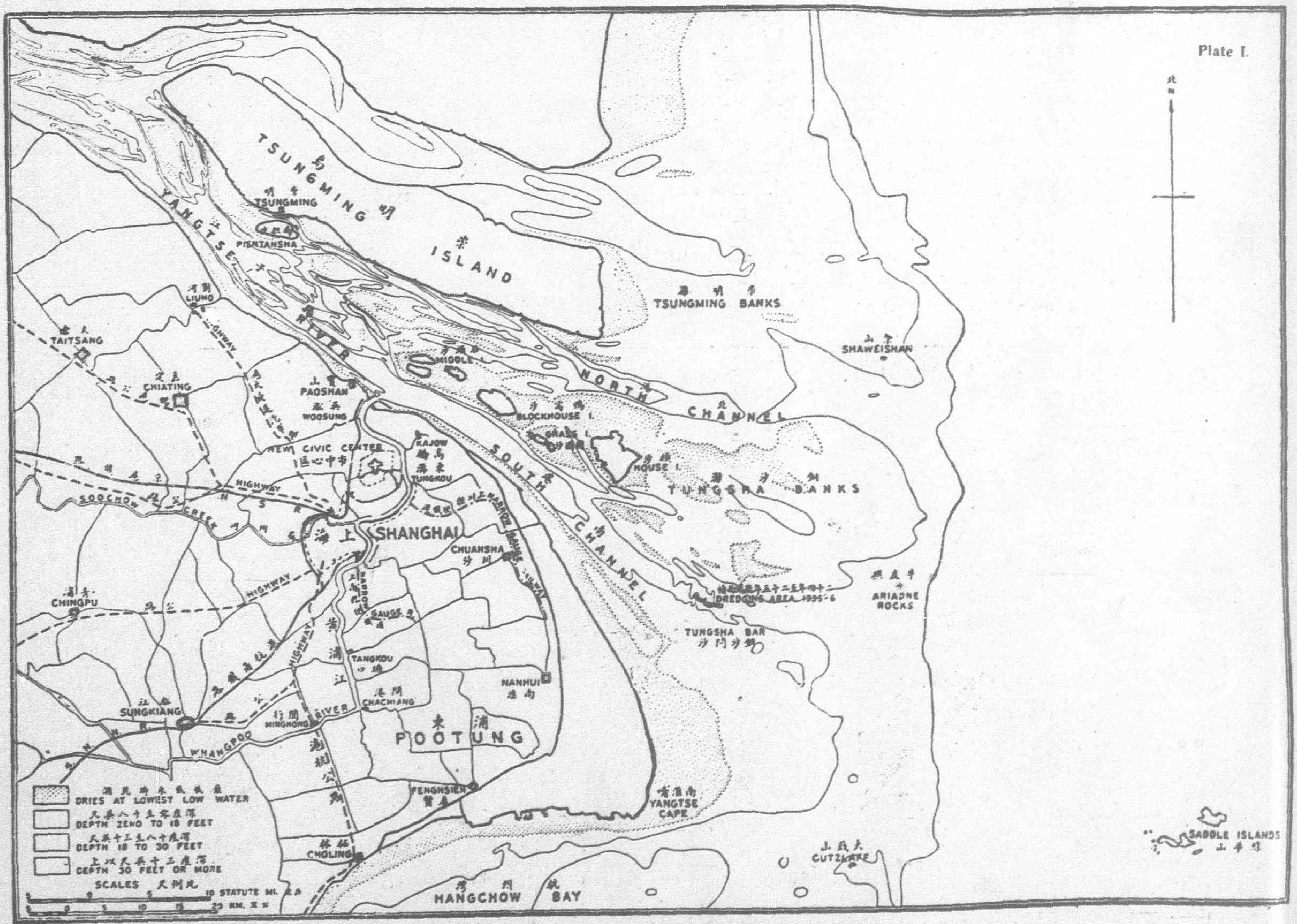
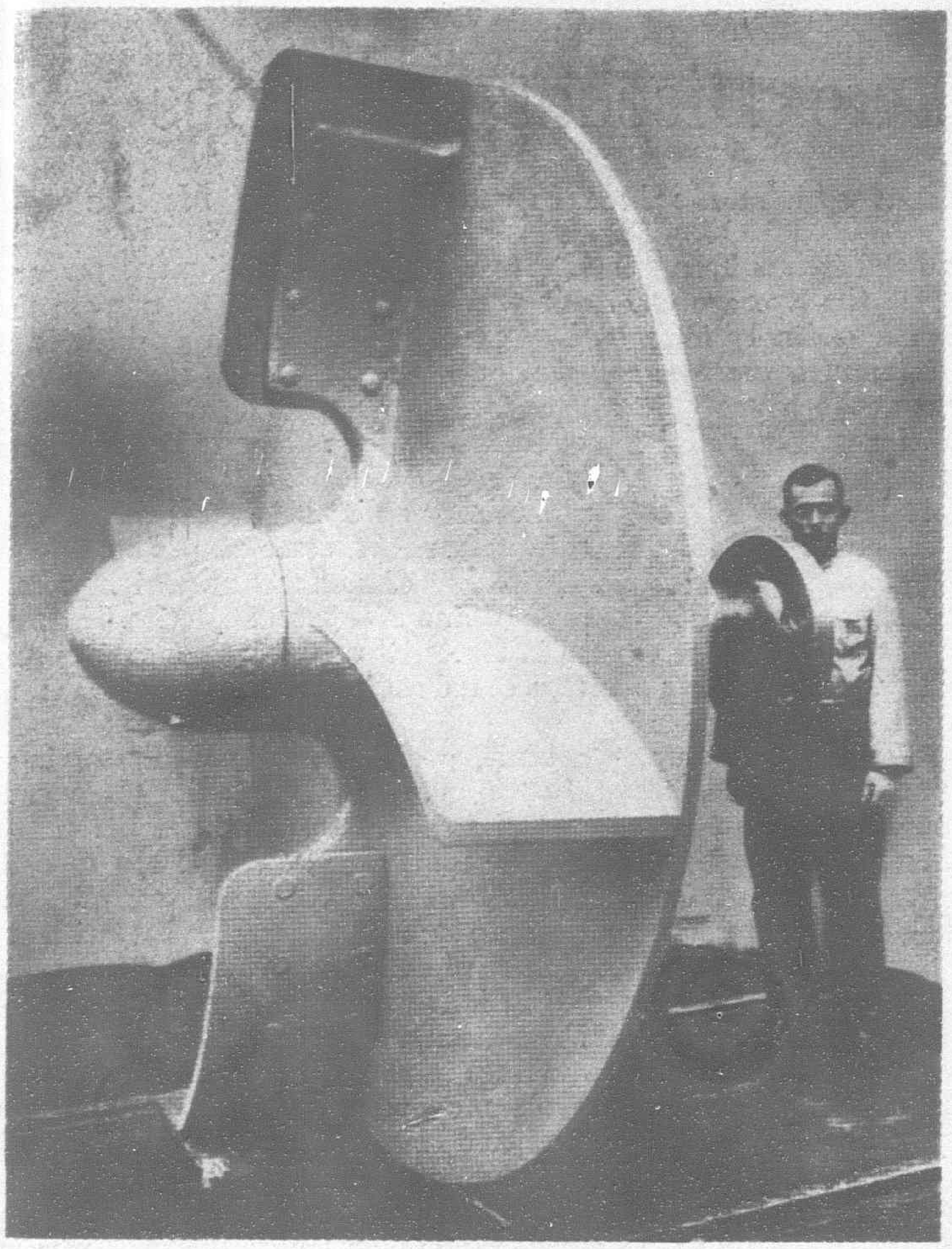


Chart showing the approaches]to Shanghai



Dredging pump impeller

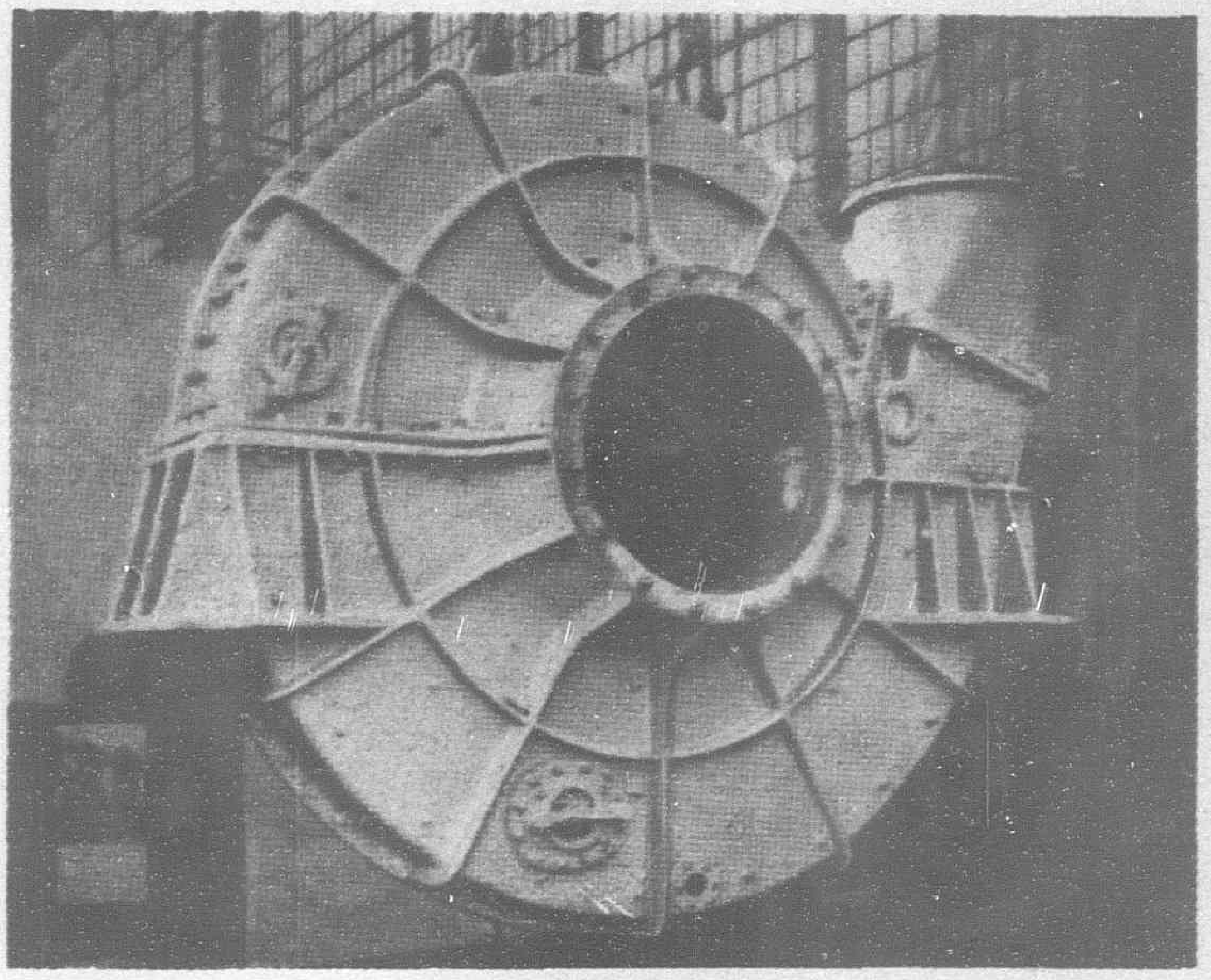
dredging well for working at night, also a 6,000 Watt searchlight is installed and arranged for working from the navigating bridge.

The main switch-board is composed of polished "Sindanyo" panels built on a steel framework and arranged with the usual light and power circuits, switches and cut-outs. The instruments and fittings are of Siemen's make.

Trials and Delivery

The keel of the *Chien She* was laid in the Danzig yard of the builders on March 1, 1934, and on September 15, the vessel was successfully launched by Madame Liu Chung Chieh, wife of His Excellency the Chinese Minister at Berlin.

Before leaving on the voyage to Shanghai the dredger carried out a series of preliminary dredging and speed trials at Pillau at the entrance to the Konigsberg Canal, in mid January, under unusually severe cold-weather conditions.



Main dredging pump

The *Chien She* arrived at Shanghai on April 14, 1935, and after docking for adjustment of the hopper doors and re-assembling of the dredging equipment, the vessel was put into service condition and proceeded on official trials, commencing on May 8, 1935. The trials prescribed in the Board's agreements with the builders were of a full and exhaustive nature, covering a period of 100 hours dredging at the Tungsha Bar in the Yangtze Estuary, speed trials, endurance trials, and coal and oil fuel consumption trials.

These were successfully completed within ten days of the commencement, the vessel showing a highly satisfactory performance on all trials.

The dredger was officially accepted by the Board as from July 3, 1935, and thereafter was commissioned for service, commencing regular dredging operations at the Tungsha Bar on July 8, 1935.

Progress of the Dredging Operations at the Yangtze Bar

It was clearly demonstrated by the satisfactory performance of the dredger *Chien She* on the official trials and preliminary dredging operations at the Bar that the Whangpoo Conservancy Board has been particularly fortunate in the choice of this type of dredger for the important undertaking of dredging the Yangtze Bar.

The mud, clay and sand materials comprising the Bar can be readily excavated, and further, the center-well disposition of the drag head which has been incorporated in the design has proved eminently suitable for the tidal and weather conditions at the dredging site, the dredger *Chien She* being exceptionally easy to manœuvre in the prevailing cross currents when dredging at a speed of about three knots over the ground.

During the period the *Chien She* has been on service up until the end of July, 1936, a quantity of 4,296,110 cu. yds. of material has been dredged from the crest of the Bar, and deposited on the

(Continued on page 448)

Name of Dredger	*Leviathan*	*Chien She*	*Pierre Lefort*	*M.O.P. 217c*	*Rietbok*
Year Built	1909	1935	1934	1929	1930
Builders	Cammel Laird	Schichau	Deschimag	Werf Gusto	Simons
Length B. P.	465-ft. 9-in.	360-ft. 0-in.	337-ft. 0-in.	325-ft. 0-in.	374-ft. 0-in.
Beam Moulded	69-ft. 0-in.	60-ft. 0-in.	54-ft. 0-in.	52-ft. 6-in.	57-ft. 9-in.
Depth Moulded	30-ft. 7-in.	26-ft. 6-in.	26-ft. 0-in.	23-ft. 0-in.	25-ft. 9-in.
Designed loaded draft	23-ft. 0-in.	18-ft. 0-in.	19-ft. 0-in.	18-ft. 0-in.	18-ft. 0-in.
Material designed for	Sand	Firm Mud	Various	Light Mud	Sand
Type of Dredger	Moored Suction Flexible Head	Drag Suction Scooping Head	Trailing Suction Flexible Head	Drag Suction Scooping Head	Moored Suction Flexible Head
Hopper Capacity, to Deck Level cub. yds.	6,700	3,700	2,610	2,610	3,700
Dredging rate in cub. yards per hour	8,000	Normal 8,000	3,300	8,000 Contract (14,000 Trials)	4,000
Number and size of Suction pipes	4 at 42-in.	1 at 43-in.	2 at 25½-in.	1 at 37-in.	1 at 42-in.
I.H.P. of Pumping Engines	2,800	2,400	2,000	2,000	1,350
I.H.P. of Propelling Engines	4,000	3,000	3,000	2,000	3,000
Total I.H.P. of main Machinery	6,800	5,400	5,000	4,000	4,350
Type of Machinery	Steam	Steam	Diesel Electric	Steam	Steam
Speed in knots, loaded	10.5	11.0	11.0	9.0	11.5
Maximum Dredging Depth in feet	70-ft.	45-ft.	65-ft.	50-ft.	No information
Location of service	Mersey Bar	Yangtze Bar	Bordeaux Bar	Punto Indio	Durban Bar

Street Lighting by Electric Discharge Lamps

By G. S. ROBINSON, M.A. (CANTAB.), in The Journal of the Engineering Association of Malaya

The fundamental problems in highway lighting concern illuminating rather than electrical engineering. Nevertheless they bear heavily on the electrical part of any installation and are therefore important as purely electrical matters to the electrical engineer.

The high pressure mercury vapor lamp has not only provided a light source of nearly three times the efficiency previously available with gasfilled lamps, but its use has brought about unexpected developments in the knowledge of street lighting and a change in the basis on which installations are designed.

Two types of discharge lamp have been used for public lighting—namely the sodium vapor and the mercury vapor lamp. In England the mercury vapor lamp was first employed and is now far more extensively used. About 20,000 of these are in daily use for street lighting alone and many more for the lighting of factories, yards, garages and other industrial purposes. The sodium vapor lamp has also been employed, but to nothing like the same extent. The reasons for this I will later try and explain to you.

The high pressure mercury vapor lamp consists of a tubular glass vessel containing gases and a small amount of mercury. In this tube, at each end is sealed an electrode. On applying a difference of potential between the electrodes, a discharge passes which raises the temperature of the electrodes and the bulb. When this temperature is sufficiently high, the mercury is vaporized and the discharge takes the form of a narrow bright arc between the two electrodes.

Figure 1 shows a standard construction of the higher wattage types. The electrodes at each end consist of a stick of rare-earth oxides, held in a tungsten spiral. The bulb contains rare gases such as argon at a low and critical pressure and a carefully measured quantity of mercury. So that the mercury will be quickly vapored and so that the vapor pressure will remain reasonably constant, the bulb is sealed into an outer jacket to prevent sudden temperature changes. This outer jacket is filled with low pressure oxygen, as this is found to reduce in some indirect way the formation of blackening on the inside of the inner bulb, caused by the slow disintegration of the electrodes under the influence of the discharge. The ends of the inner bulb are also given a metallic coating to ensure a high temperature at these points.

An auxiliary third electrode is used to help starting. This takes the form of a wire sealed into the inner bulb near one main electrode. It is connected through a high resistance placed in the cap of the lamp to the opposite pole of the cap to which the nearby main electrode is connected.

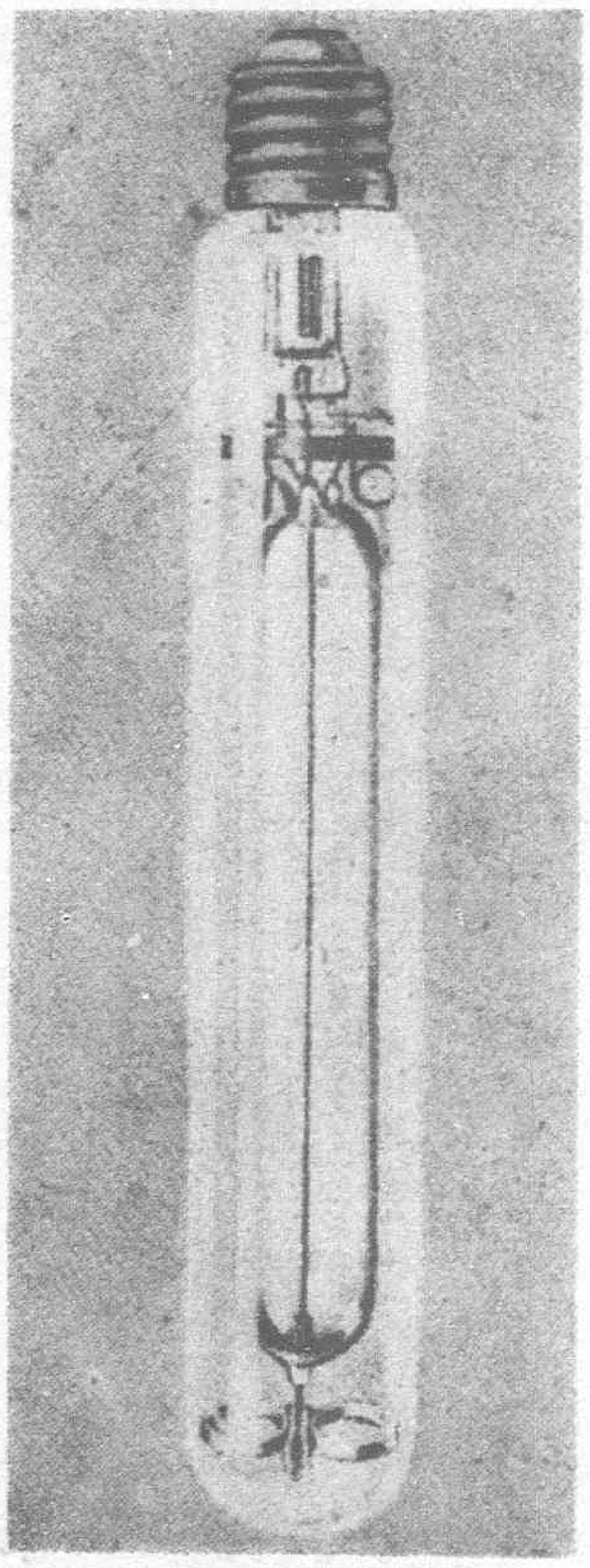


Figure 1

When the supply is switched on, the full mains voltage occurs between the auxiliary and main electrodes. This causes a slight discharge here which ionises the gases in the tube. This in turn causes the resistance through the gases in the tube to drop to a lower value than the resistance in the auxiliary circuit, and the discharge therefore now takes place between the two main electrodes, which fills the whole tube with light. The temperature in the tube rises, vaporizing the mercury and the luminous column becomes narrower and brighter.

The resistance of a discharge lamp falls as the current through the lamp increases, and for this reason it is necessary to employ a stabilizer to prevent the current rising to a value which would destroy the lamp. Normally a choke is used for this purpose owing to the small wattage loss which occurs, and therefore lamps are constructed to burn on A.C.

These lamps have a very high luminous efficiency, and this, as our experience increases, is constantly being raised. The rate of progress is rapid and the limit of efficiency is not yet in sight. For instance, when the 400 watt lamp was first introduced the initial efficiency was 40 lumens per watt. As knowledge has increased it has been possible to raise this to 45 lumens per watt, while the average efficiency throughout life has been more than correspondingly improved. Over a 1,500 hour life which is the minimum average which can be expected from a mercury vapor lamp, the average efficiency is about 85 per cent of the initial efficiency. In the original lamp this figure was only 75 per cent of, as explained above, a much reduced initial efficiency. A simple calculation from the above data shows that in 3½ years the average efficiency throughout life has been raised some 27 per cent.

The greater part of the visible radiation from the high pressure mercury vapor lamp consists of line spectrum radiation but there is also some continuous radiation. All colors are present to some extent, but there is a shortage of red radiation, and a preponderance of blue-green.

In the sodium vapor lamp, a similar method of starting is employed using a rare gas such as argon, and the lamp comes up to full efficiency slowly as the sodium becomes vaporized. In this case, however, it is necessary to employ a voltage of about 470 for starting the discharge. This is usually done by using an auto transformer coupled with the stabilizing choke, which is necessary with any discharge lamp. This is an added complication to the circuit and in addition, it is the opinion of the author that such a voltage applied at the height that street lamps are usually mounted would be highly dangerous to maintenance and cleaning staff in the event of a wiring fault occurring.

The light source in the sodium lamp also is wattage for wattage very much longer than the mercury vapor lamp, and therefore more difficult to control in a fitting and utilize efficiently on the road surface. Owing to the physical dimensions necessary in the sodium lamp 150 watts is the largest size it is practicable to make and the standard dimensions of sodium lamps compared with mercury vapor lamps are given in Table 1.

TABLE 1

	Sodium Lamp		*Mercury Lamp*	
Wattage	*Overall length inches*	*Diam inches*	*Overall length inches*	*Diam inches*
70	12.2	2	—	—
80	—	—	5.4	Standard 100 watt bulb
100	16.75	2	—	—
125	—	—	6.3	Standard 150 watt bulb
150	22	2.5	9.3	1.75
250	—	—	11.4	2
400	—	—	12.8	2

From this table it will be seen that the 150 watt Sodium lamp is more than twice the size of the 150 watt mercury vapor lamp and that the 400 watt mercury vapor lamp is comparable in dimensions with the 70 watt sodium lamp. When we come to the cost and efficiency of fittings to house these lamps, this point becomes of considerable importance.

Coming to the question of efficiency, the average efficiency of the mercury vapor lamp is some 75 per cent that of the corresponding sodium lamp, but in comparing these efficiencies there are several important points to remember.

The first point is the color difference. The emission from a sodium vapor lamp consists of a monochromatic yellow light which is confined to a very narrow wave band. As a result, all objects which are not yellow appear brown or even black under sodium light, and this color distortion is very apt to be misleading.

With the mercury vapor lamp, as described above, although color rendering is admittedly not perfect, it is very much nearer to daylight.

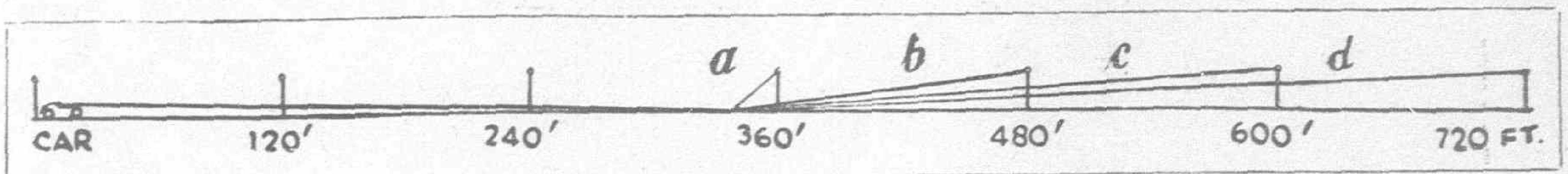


Figure 2

Again it is quite possible to modify the color values of mercury vapor lamps and this has already been done to some extent in the new low wattage lamps, without loss of efficiency. Further modification to a daylight color is now in the course of laboratory development and this is in conjunction with an increase in their efficiency at the same time, by the use of flourescent substances. Briefly, the ultra violet radiations of the mercury vapor lamp, which are invisible and therefore useless, as far as illumination is concerned, can be put to good service by exciting flourescence. By coating the interior surface of the outer bulb with flourescent powders (which are there stimulated by the ultra-violet rays and produce additional light containing a high proportion of red rays) these hitherto invisible radiations are utilized, the added light being of a pleasing color. What is lost by absorption in the powder is more than gained by this flourescence—the result being increased efficiency and a great improvement in color.

It is, on the other hand, very unlikely that the color of the sodium lamp can be modified at all, as there is no commercially applicable substance which responds satisfactorily in flourescence to it.

As regards the future, it is practically certain that there will be much greater improvements in the mercury vapor lamp than in the sodium. The 80 watt mercury vapor lamp, compact and of high efficiency has a light source which lends itself particularly well to efficient directional control in a fitting. The indications are that efficiencies will continue to rise. The color will be further improved, the life will be prolonged and the lamp itself will be made more simply and therefore more cheaply. There are, however, no signs of similar improvements in the sodium lamp.

When we come to the question of good and bad street lighting we are up against a very difficult problem, that is the problem of how we see.

The eye sees by contrast, i.e., an actual difference of brightness or of color.

Obviously if everything were of the same color and uniformly bright, we could not distinguish objects from their background even in daylight, because there would be no contrast.

Now as daylight fails and dusk falls, what happens? In about 30 minutes illumination falls to about 1/200th of its original value. As the light falls to one foot candle and then to 1/10, the contrasts between objects have grown less and less. A pedestrian may appear to be wearing a dark or a light suit, but the color is indefinite. At such low illumination the eye is rapidly losing color sensitivity. The ricsha which you could see clearly in contrasting colors by daylight, now merges into a dull grey indeterminatem ass and finally through lack of contrast becomes invisible against the also dull grey road surface. So we see that all contrasts diminish as the light fades, until in complete darkness we can, of course, see nothing at all.

The fundamental object therefore of street lighting is to restore those contrasts and to do this we can either increase the brightness of the objects we wish to see, or of their background.

There is another reason why we must increase contrast. This is due to the sensitivity of the eye. The human eye will work quite well over a range whose ratio is 1/10000, i.e., the difference between broad daylight when illumination may be of the order of 1,000 foot candles or more and bright moonlight where the illumination is very much less than 1/10 foot candle. We have all seen a motor-car headlight inadvertently switched on in daylight. There is no glare even if you stare at it. But in daylight the brightness of surrounding objects is comparable with the brightness of a headlight and the eye is adapted to it. By night it is an entirely different story.

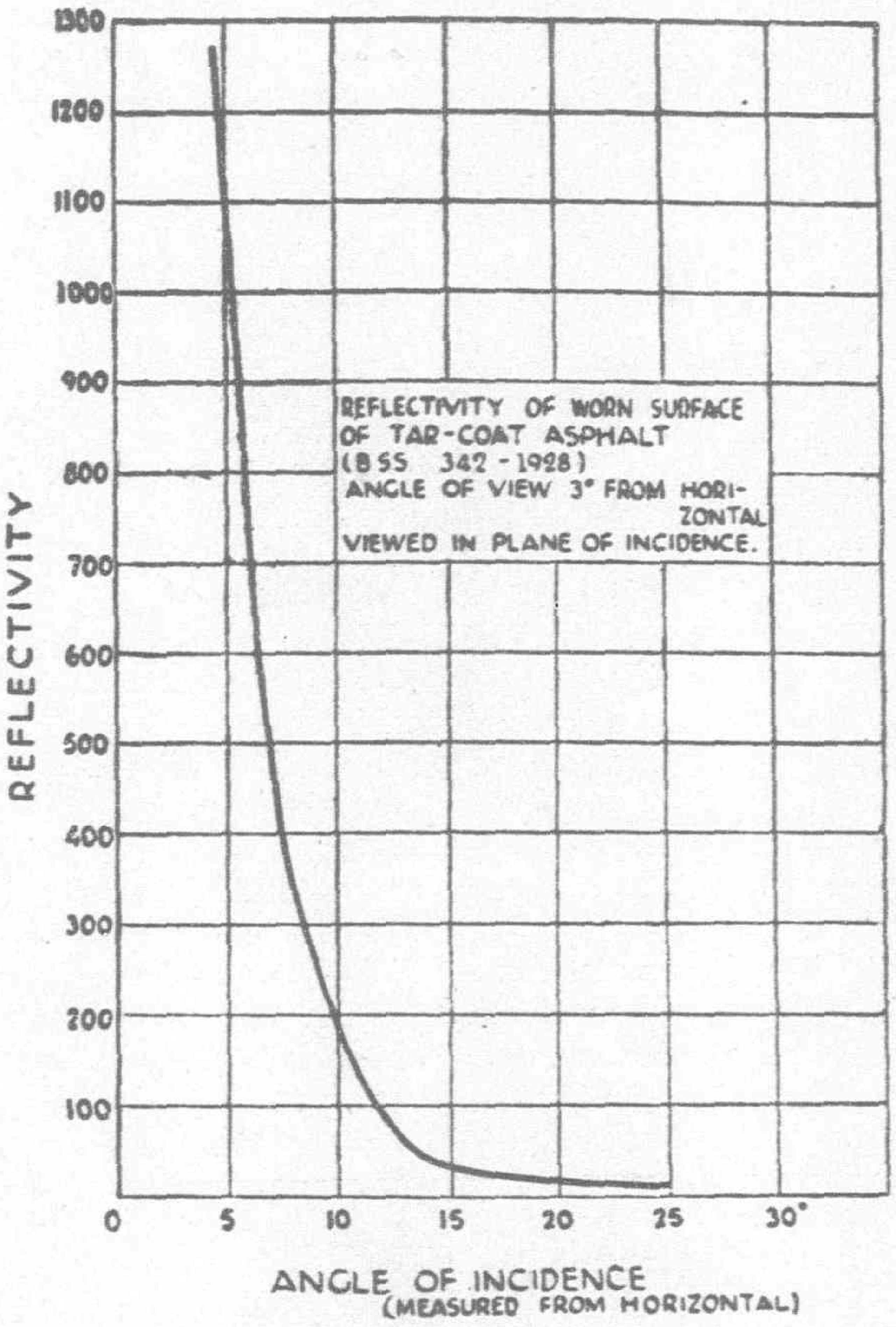


Figure 3

Then you get glare, because glare is a question of contrast, and the contrast between the headlight at night and surrounding objects is greater than the eye can accommodate. It takes place in the eye because a road is a comparatively narrow field of vision, and close to the portion of the retina on which the lens of the eye is focussing the object we are trying to see, it is also receiving this dazzling light. The eye in self protection adapts itself to the brighter light and as a result the contrast between objects on the road which is very much less now becomes indistinguishable. Therefore for this reason also it is most essential that our street lighting shall increase contrast.

There are two ways of doing this. One is to light up objects on the road, while the other is to light up the road surface itself by making it as bright as possible, in which case the objects show up in silhouette. The latter solution is the preferable, in fact the only solution. The reason for this is that the majority of objects seen at night are dark. Even a light coat only reflects about 15 to 20 per cent of the light which falls on it.

But here you will say that most road surfaces also are dark, which is quite true. In this case, however, we are going to take into account another property of road surfaces, namely polish. Light can be directed on the road in such a way as to utilize the tendency to reflect like a mirror, i.e., specularly. This occurs when light is directed along the road surface at an angle of incidence near the horizontal. This effect is well shown by a piece of polished black marble. If you look straight at it, it looks quite black, but by looking along it towards a light, you see the polish as a bright surface reflecting that light.

Looked at in this way, the brightness of a dark asphalt road can be far greater than the brightness of the same road when covered with snow.

Before considering how this idea is applied in practice and the effects produced in practical installations, we shall do well to study a few road surfaces and their optical properties.

Referring to figure 2 which represents to scale a stretch of road with lamp posts, imagine yourself in the car at the left hand side of the diagram. We have seen that we are mainly interested in the light which comes very horizontally as for instance along such beams as "b," "c" or "d." The light from the post nearest the spot you are passing is of little importance to you, because your attention when driving is concentrated on the road much further ahead.

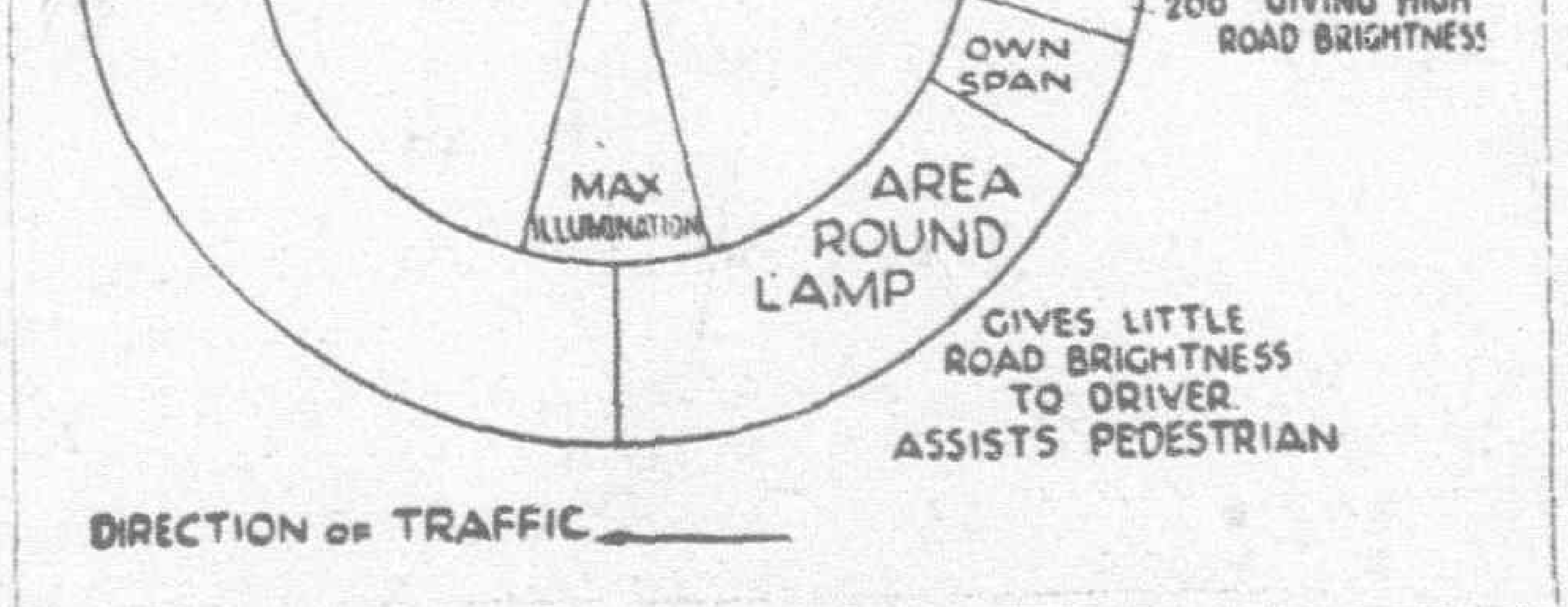

GLARE
800
500
400′
300′
200′
BEAMS GIVING HIGH ROAD BRIGHTNESS
OWN SPAN
MAX ILLUMINATION
AREA ROUND LAMP
GIVES LITTLE ROAD BRIGHTNESS TO DRIVER ASSISTS PEDESTRIAN
DIRECTION OF TRAFFIC

Figure 4

Beam "a," which arrives on the road at an angle of say 40 degrees, is probably the steepest angle in which we are interested, i.e., about 100 yards ahead. We are interested in all light beams from this one to that which strikes the road from away off the right of the diagram at an angle of about one degree. Probably the range from 15 degrees to one degree is the most important.

Now as the actual amount of light flux which reaches the road at the end of, say, the three degree beam is (owing to the angle of incidence and the distance away) only 1/50th of that which reaches it along the ten degree beam "b," we should like a road surface which would be a reflector fifty times better at three degrees than at ten degrees. Roughly speaking, this is what many road materials tend to be. Figure 3 shows how, owing to this property the reflection efficiency increases as the angle of incidence of the light changes from ten to three degrees.

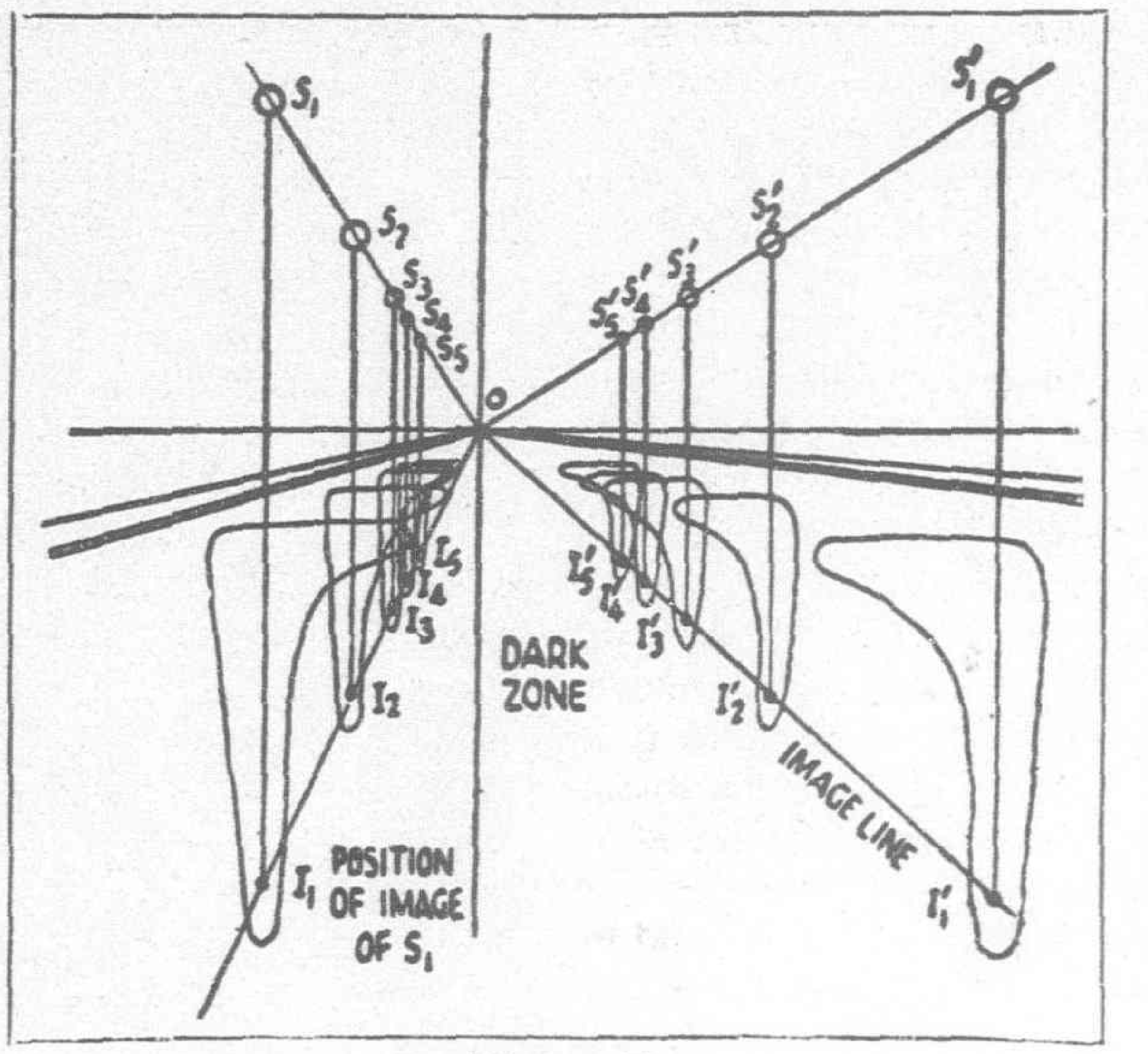


Figure 5

Figure 4 shows roughly the way in which light emitted in different zones from a street fitting is employed. Note particularly the beams giving high road brightness. These beams afford the light flux which contributes mainly to the visibility at the point on the road where the motor driver most wants it, i.e., that emitted between one and 15 degrees below the horizontal. As before mentioned, this is because the driver of a fast moving vehicle looks usually at the road upwards of 100 yards ahead of him. He has already examined the road up to 50 yards ahead previously. At this distance he will see whatever objects there are on the road against the bright patches produced on the road surface by distant light sources. Thus the brightness of the road in the immediate foreground is of less importance to him, and is amply illuminated by the light which the designer cannot (if he would) direct to more distant points.

If lamps were long strips of light stretching right across the road, the result would be a broad, bright band filling the whole width of the road; unfortunately the beams reflected from the road from the compact sources we use are of limited width.

It is the same effect as that of the moon shining towards us over water. If the water is nearly smooth, the moon's reflection is a narrow bright path of light stretching away towards the moon in the distance. But if the water is slightly disturbed, the path of light is wider sideways. Some roads are very polished and give the former effect, but these are exceptional except when wet. Others are fairly rough and give the beam a sideways spread.

It is therefore important for the illuminating engineer to know what road surface he has to deal with, because the brightness of the surface, upon which everything depends, consists mainly of a series of these paths of light stretching away to the lamps ahead.

Now let us very briefly analyse these road reflections. If the road surface were flat, and a perfect mirror and had the usual two lines of lamps on either side, a motorist would see the reflections of these lamps as two lines of points on the road surface.

But the road is rough and uneven and as a result the points turn into streaks and these run from the theoretical reflection point along a line joining the observer to the post.

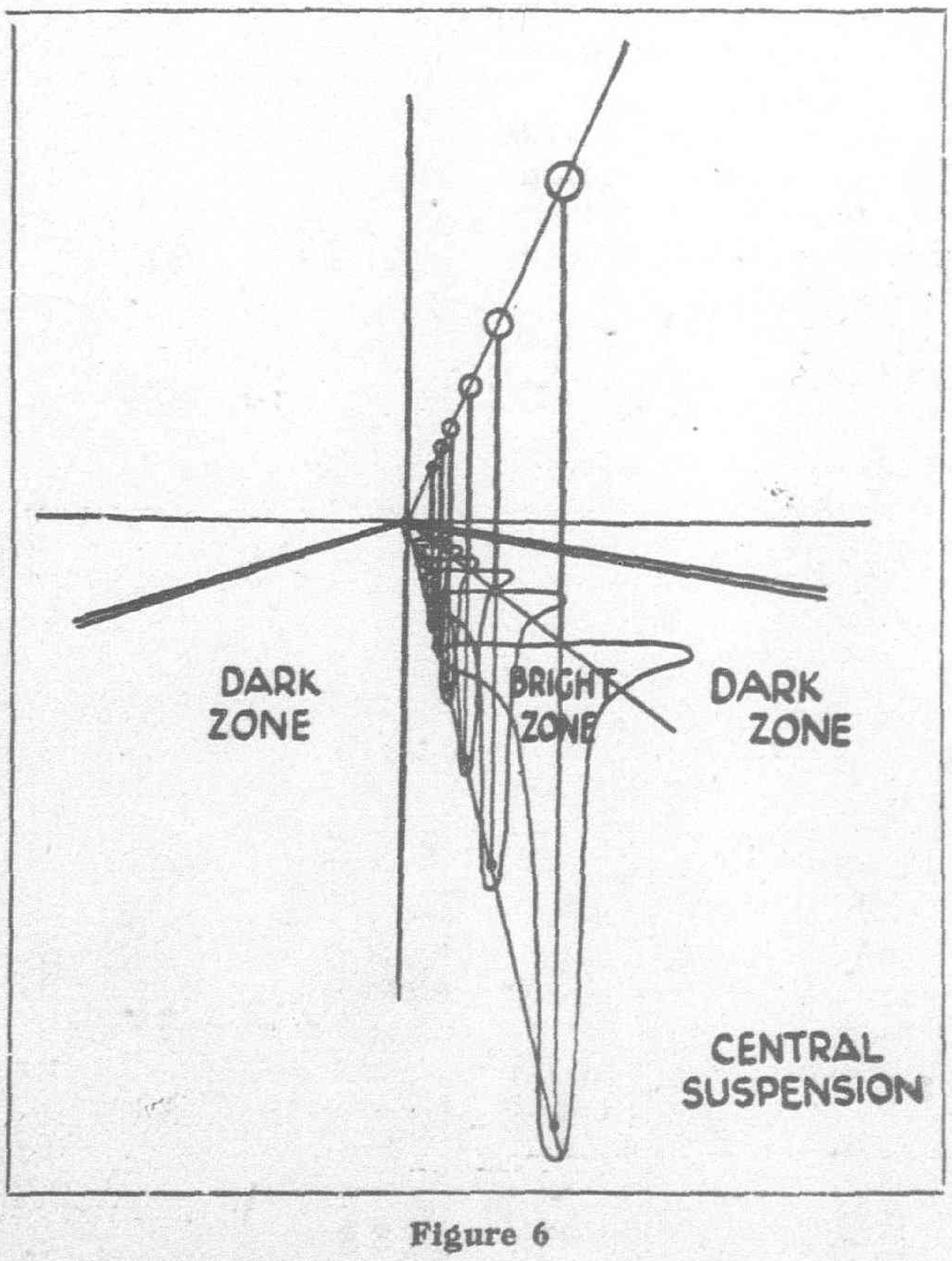


Figure 6

Figure 5 shows the streak patterns developed as they appear in practice. It would appear therefore that the sides of the road would be bright while the center would be less bright. But the width of the darker central portion varies with the mounting height and the amount of camber on the road, and with a normally slightly cambered road, employing about a 25 foot mounting height, we get the effect of broadening the horizontal bright streaks so that these almost meet, and about 85 per cent of the road surface is bright.

We now see why central suspension has a definite disadvantage compared with side lighting. Figure 6 shows the bright streaks from centrally suspended lanterns. The middle of the road is well illuminated, but the most important part, i.e., the track of a motorist who is keeping to his own side is the darkest and unless the road is narrow there are no bright streaks to give a contrasting background to objects ahead.

The second method of lighting a road is by illuminating it as highly as possible, assuming that this will give a good road brightness by diffused reflection of the light from a fitting, which reaches the road within its own span. The light sources then are put close enough together and high enough to produce a reasonably even illumination.

By this arrangement, with the usual rather dark road surface, the road brightness for the same wattage is comparatively low, and so contrasts tend to be poorer. We do, however, obtain an effect which some people at first claim as an advantage. The light sources are shielded and cut off from the eye. People are often attracted by the effect of a road bathed in a soft glow of light, and we certainly obtain good visibility, provided there are no other lights on the road. But as soon as other lights such as motor sidelights appear, the eye becomes insensitive to the lowered contrasts, and the good visibility previously seen disappears.

In the system described above, using the road polish, the exposure of the light source to the eye is not harmful, because owing to the high road brightness, contrasts are good and are not seriously interfered with by light from the exposed lamps. This is not to be confused with some old and out of date streetlighting, where we have bad contrasts owing to the wrongly designed lanterns, often mounted too low, which do little but illuminate a small patch of road near the lamp post. We are all familiar with the often very glaring effect such fittings give, and it is probably because people cannot visualize anything better from an exposed light source, that they call for a cut off fitting. This latter admittedly is far superior to a glaring fitting, but for exactly the same reasons that a motor-car headlight is not glaring by day, so in a properly designed installation of street lighting, exposed light sources need not be glaring at night.

Another reason why a new installation may be condemned as glaring, particularly if it employs discharge lamps, is that when you are taken to examine it, the tendency is to look at the fitting to see what it is like, rather than to look at the road, which is what you would normally do if you drove along it.

We do not eat our dinner staring at the lamp over the dining room table. If we did, we should certainly find it glaring. By the same token, we do not drive down a road looking up at the street lamps. It is a simple point, but one which many people do not grasp.

How does this theory of street lighting fit in with the new type of light sources offered by the mercury vapor and the sodium vapor lamps ?

In approaching the subject, we find we have a long tubular light source instead of the compact light source of the filament lamp. In the latter case the polar curve from the bare lamp shows that more light flux is directed vertically downwards than horizontally, whereas with a discharge lamp the reverse is the case. Let us consider the mercury vapor lamp first.

If we hang the lamp vertically, we shall obtain a natural distribution from the discharge lamp tending to emit light at angles near the horizontal, which we have seen is what we need to give high road brightness. But more than this is necessary. We must, either by reflectors or prismatic refractors, give a more intense light distribution up and down the road than across it, otherwise the light flux will be largely wasted. Also the lamp by itself would be so bright as to be glaring, and so diffusion is introduced into the glassware of the lantern.

Now let us consider the sodium lamp. Referring once more to the dimensions given in Table 1, we see that the 400 watt mercury vapor and the 70 watt sodium lamp are just about the same size. The 70 watt sodium lamp gives approximately the same light output as a 250 watt gasfilled lamp would. The 400 watt mercury vapor lamp gives approximately the same light output as a 1,000 watt gasfilled lamp.

Owing to the dimensions of the 400 watt lamp, it is necessary in order to employ its light output efficiently, to house it in a lantern of about the same physical dimensions and cost (though naturally of a different optical design) as we should a 1,000 watt filament lamp, and as it gives the same light output, this is a reasonably economic proposition. To give a similar light distribution, we should also have to house a 70 watt sodium lamp in a 1,000 watt size lantern, owing to its physical dimensions, but it would give only one-fifth of the light output.

From this it will be seen that a sodium installation based on using the " shine of the road " would be economically quite out of the question. There is no street lighting engineer who could put up a case for housing a 250 watt filament lamp in a 1,000 watt lantern, which is, in effect, similar to what we should have to do using sodium.

When we come to the larger sizes of sodium vapor lamp, a quick reference to their dimensions will show that it is practically and economically out of the question to house them in a lantern of this type.

With a sodium lamp, therefore, in order to keep the cost of the large lantern required, to a figure, which will make street lighting an economic proposition at all, it is necessary to adopt a very simple construction. The only simple efficient construction we can devise is a cut off lantern with the lamp burning horizontally.

But here again we are up against a high installation cost, because if you employ cut off lanterns, they must be spaced at very close intervals if even road brightness is to be obtained.

Coming down to actual practice, the usual spacing between units for a sodium installation is 90 feet. There are a few spaced as far as 120 feet apart, but as far as the author is aware no greater spacing than this has ever been adopted, and even at this spacing there are very deceptive dark shadows between units.

Using mercury vapor lamps in suitably designed lanterns really good road brightness can be obtained at 150 foot spacing, even at 200 foot spacing, in the author's opinion more even lighting is possible than when sodium units are spaced at 120 feet. From this it will be seen that the installation and running costs of a sodium, compared with a mercury vapor job are very much greater, in spite of the greater light output, watt for watt of the sodium lamp itself.

Quite apart from this question, we have already seen earlier in this paper that we shall get a far higher road brightness, by using the shine of the road surface than by using the diffuse reflection of the road surface, which we must do when we employ a cut-off fitting. And we have seen that if we use sodium, we practically have to use a cut-off fitting. The optimum installation, given a road surface of average characteristics and duly considering present economic conditions, can now be summarized. A mounting height of 25 feet is desirable, with posts staggered on each side of the road, except on bends, where all posts should be on the outside of the bend. The spacing between posts should be 150 feet. The width between rows of posts on each side of the road not more than 30 feet. Roads more than 45 feet wide need three rows of lights for optimum results.

The light distribution from the lantern should approximate to the following. The ratio of the maximum intensity to the downward vertical intensity should not exceed 6 to 1 to avoid glare. The region of maximum intensity should extend from 75° to 87½° above the downward vertical. Above this angle it should diminish rapidly to avoid waste of light flux.

In conclusion :—The limit of improvement to the mercury vapor lamp has been nowhere near attained. Indications point to a considerable improvement both in color and efficiency, during the next few years. While at present the sodium vapor lamp is about 25 per cent more efficient in light output, there are no present indications that this can be materially improved on, nor that the color can be modified.

The range in wattage of the sodium lamp is limited to a maximum of 150 watts. The range of the mercury vapor lamp is not so limited and larger lamps could be made were there a demand for them.

The physical dimensions of the sodium lamp are unwieldy so that the light is difficult to control in any directional fitting. The new smaller sizes of mercury vapor lamps are similar in dimensions to filament lamps and for street lighting it is possible to use the light output from a unit very much more efficiently.

With lanterns, whose maximum light intensity is at a high angle to the vertical, it is possible to space units in a street more widely with a great reduction in total costs compared with a cut-off lantern, whereas with sodium it is not practically possible to use such a lantern.

The high voltage necessary to start the discharge in a sodium lamp, is a possible source of danger in street lighting installations.

The author is indebted to Mr. C. C. Paterson and Mr. J. M. Waldram whose practical investigations and work on the theory of road brightness have been of great assistance in compiling this paper.

Soviet Policy in The Far East

(Continued from page 425)

schemes of the Moscow leaders, and who have been rounded up and transported in trucks to the remote parts of Russia and Siberia to work long hours at hard unskilled work for just a subsistence ration. The costs of this railway construction are thus reduced to a minimum.

Import and export trade in the Far Eastern Region are, as in the rest of the U.S.S.R., in the hands of the Government, but the organizations are separate from those of the rest of the Union. The principal organization is the " Dalgostorg," or Far Eastern State Trading Co., with offices in China and Japan. For the export trade in wood a special body exists, the " Dalles " or Far Eastern Timber Co. Then there is a Far Eastern branch of the " Centrosoyus " of the U.S.S.R. or Central Consumers' Co-operative. The only banking institution in the Far Eastern Region is the " Dalbank." The head offices of all the various trade organizations are in Vladivostok.

All the Soviet trade agencies in Manchoukuo have been closed down except the office in Dairen. The Soviet commercial interests in Manchoukuo have been reduced to almost nothing, yet the relations between the Far Eastern Region and its new neighbor have by no means ceased. In fact, a Manchoukuo consul has been admitted in Blagoveshchensk, and the nomination of two more consuls in Habarovsk and Vladivostok is expected. Manchoukuo, though not formally recognized by the Soviets, enjoys *de facto* recognition. The sale of the Chinese Eastern Railway emphasized this. Economically there are too many ties with the Far Eastern Region for the Soviet authorities not to take an essentially practical view of the political situation.

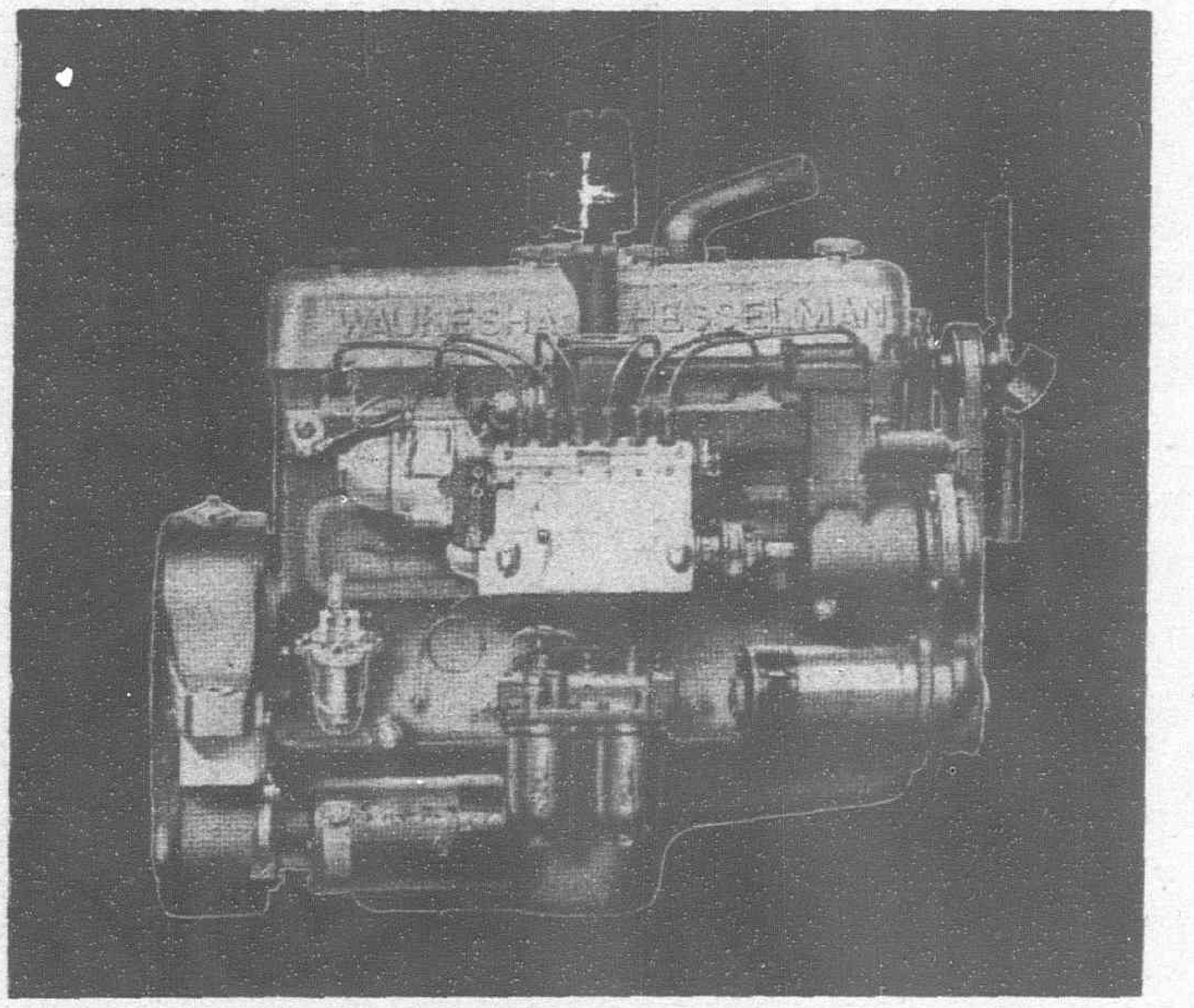
The Waukesha-Hesselman Oil Engine

SINCE radio no product of the scientists' skill has so captured the public fancy as the Diesel engine. To the average man, the term means "cheap power." To most engine builders, it can only mean one thing—a high pressure, oil burning engine using compression ignition.

But to the Waukesha Motor Company, it has a much wider significance for in addition to the Waukesha Comet Diesel, there is the Waukesha Hesselman Oil Engine—an engine that burns the same cheap fuels that are commonly used in modern high speed Diesels, but without the Diesel's high pressures.

Hesselman engines are not offered as a substitute for compression ignition Diesel engines. Rather the Hesselman should be considered as supplementary to the Diesel . . . as an engine that expands the field of economic application of Diesel fuel oil power . . . an engine that will fit into many places where a Diesel engine cannot be economically applied.

A Hesselman engine is similar to a Diesel in two very important respects, (1) it burns the same kind of low cost fuels that modern high speed Diesels burn, and (2) the fuel is sprayed into the cylinder by a conventional Diesel fuel pump, but at this point the similarity ceases. The Diesel fires the charge by compressing the intake air so much that it becomes very hot and the fuel ignites spontaneously when it is sprayed into this hot, compressed, charge of air. In the Hesselman engine, the compression is kept low, and a spark plug ignites the fuel.



The Waukesha Hesselman Oil Engine

The Hesselman engine, like the Diesel engine, takes its name from its inventor, Mr. K. J. E. Hesselman of Stockholm, Sweden, one of Europe's best known Diesel engineers. His research in the full Diesel field led him to design this engine in order to overcome some of the difficulties that were common to all Diesels, and particularly troublesome with small ones.

No, that is one of the advantageous features. It is because of electric ignition that the Hesselman engine can burn Diesel fuel with neither high compression pressure nor high explosion pressure.

When Hesselman engines were first built in the U.S.—about five years ago—imported Swedish plugs were used. American-made plugs, superior to the imported plugs, are now used for Hesselman engines.

Though it is a low compression oil engine, it is not a semi-Diesel. It is true that a Hesselman, like a semi-Diesel engine, is a low compression engine that burns Diesel fuels, but the semi-Diesel employs a hot spot, a hot bulb, or super heated pre-combustion chamber instead of a definitely timed electric spark for ignition, and while the hot surface form of ignition is simple and well suited to some duties, it is very sensitive to variations in load, speed, and fuel characteristics. The temperature of the heated ignition surface and the ignition characteristics of the fuel must always be the same to secure consistent performance. If the load varies so that the hot surface cools, then ignition becomes erratic and fails. This causes excessive fuel consumption, dilution of the lubricating oil, and other operating difficulties. If the engine is overloaded the igniting surface overheats, ignition is premature, and the engine labors and pounds. Semi-Diesel engines do their best in stationary duty when the load, speed, and fuel characteristics remain constant day in and day out. They are not suited to variable loads, speeds, or fuels with even ordinary commercial variations in ignitability. Also, semi-Diesel fuel costs are apt to be high. With all these inherent disadvantages the semi-Diesel type of engine is rapidly disappearing from the field.

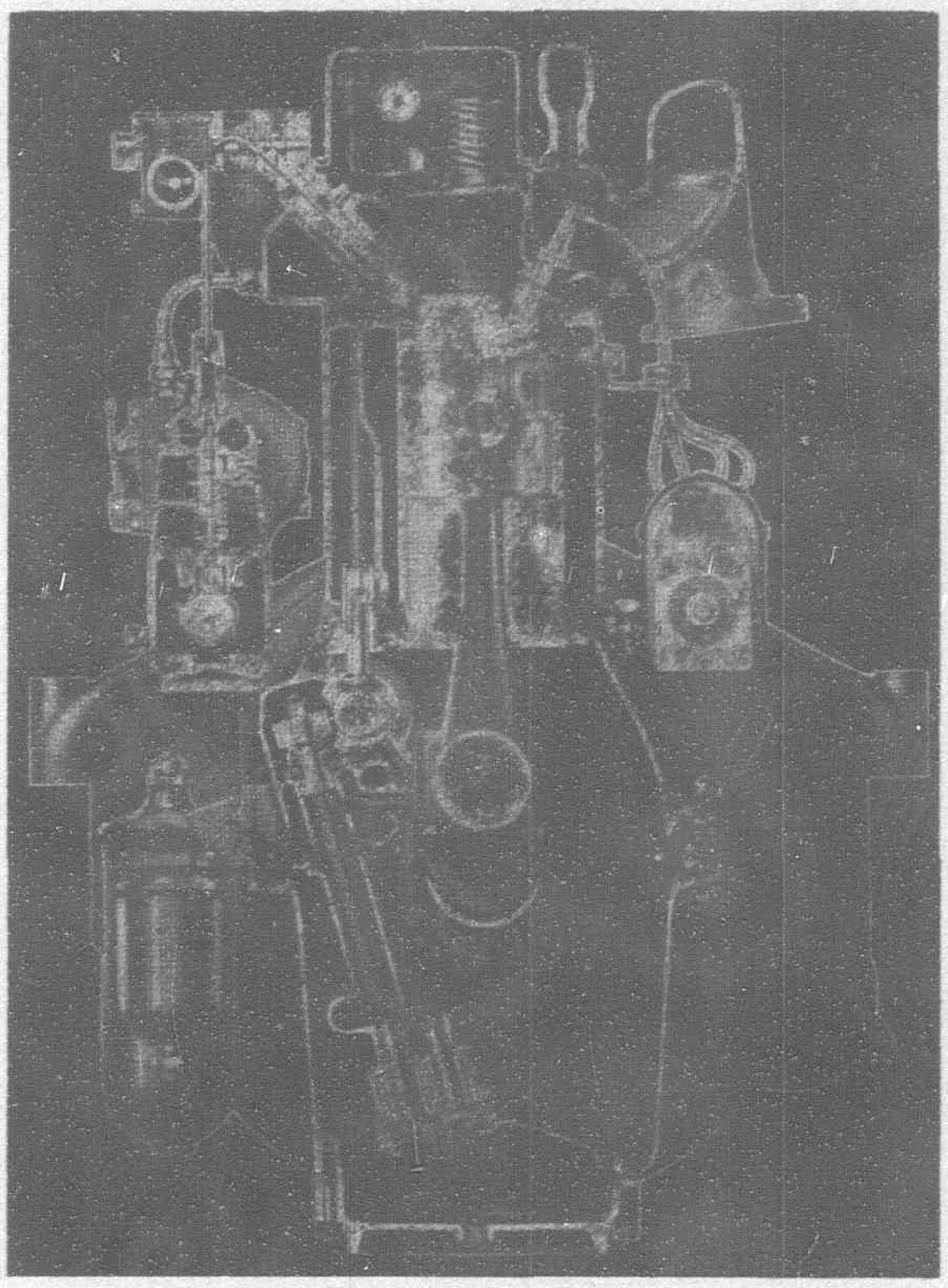
Due to the high compression of Diesel engines which must be used to secure air temperature hot enough to ignite the fuel oil, it is impractical to consider hand cranking. A Hesselman engine may be hand cranked, and started as easily as a gasoline engine of the same bore and stroke.

Another point is the inherent difficulty and expense of making pistons, rings, bearings, and other mechanical parts to withstand the high pressures, both in compression and combustion. A piston with a slight leak at compression pressures of 125 lb. per sq. in. might show serious blow-by with compression pressures of 500 lb. per sq. in.—it might even be sufficiently serious to waste enough air in compression to prevent self-ignition. Besides these operating problems, bearings, frames, and other parts to stand high pressures must be larger, and of more expensive material. Hesselman compression and combustion pressures are the same as gasoline pressures.

The Hesselman cycle is as easily understood as the gasoline engine cycle. On the intake stroke, air alone is admitted to the cylinder . . . no fuel until compression is nearly completed. The charge of air is compressed to about 125 pounds, and just before the end of the compression stroke, the fuel is forcibly injected into the combustion chamber by a conventional Diesel injection pump. The form of the combustion chamber and the arrangement of the inlet passages sets the intake air in motion as it enters, and compresses it into a definite whirlwind pattern, which picks up the finely atomized fuel from the injector, thoroughly mixes it with the air, and sweeps it as a highly combustible mixture, across the gap of the spark plug which ignites the charge. This starts the power stroke. After the power stroke, the exhaust valve opens, the piston returns, the cylinder is scavenged, and thus prepared for a repetition of the cycle. Neither the air nor the fuel is preheated so that delivered power and volumetric efficiency are correspondingly high. For a given size the Hesselman engine will give as much power as its gasoline counterpart.

The fuel is sprayed into the engine by a conventional Diesel type of injection pump. But to deliver it to the injection pump, it is first picked up from the fuel reservoir by a primary pump of the type commonly used with modern gasoline engines. This pump has a glass sediment trap and brass strainer to remove tank scale and water, and after leaving this pump the fuel is passed through two other filtering stages so that it will be freed of all harmful foreign substances before it reaches the injection system. This precaution is vital to the life of the injection system because no commercial fuels are entirely free from grit and dirt. The injection pump measures the amount of fuel needed for each charge, and provides the pressure to force open the injector valves in the cylinder head, and spray the fuel into the charge of compressed air already in the cylinder.

Most Hesselman engines are provided with the Bosch pump which is the most widely used and popular injection unit in all countries. It employs individual reciprocating plunger pump elements for each cylinder, all assembled as a single unit, so that a four-cylinder engine has four pump elements with a four-lobe camshaft for operating them. As the speed of the engine is varied by feeding more or less fuel, the injection pump does this by the throttle control rod which changes the position of a helical groove in the pump plunger with respect to port holes in the pump cylinder barrel. The plunger moves like a valve tappet, so that as the cam lifts it to force fuel out of the top of the cylinder, the two ports in the side are covered by the plunger itself on its way up. As the ports are closed, the oil which has been drawn into the upper chamber cannot escape, and as long as these two ports remain closed, the upward movement of the plunger will force oil out of the top of the cylinder barrel through the check valve and into the combustion chamber. The flow of fuel stops immediately the helical edge of the plunger uncovers the inlet port on the right, allowing the fuel remaining above the plunger to escape back to the header. Thus, since the pump stroke is always the same, if the pump plunger is rotated, a varying amount of fuel trapped above the plunger is forced into the engine depending upon the point in the plunger's stroke at which the helical groove uncovers the escape port. To insure each cylinder receiving the same amount of fuel that every other cylinder does, all of the cylinder sleeves which rotate the pump plunger are linked with a gear to teeth cut into the control rod which projects through the pump body, so that when the control rod is moved by the throttle linkage, all of the plungers are rotated in unison.

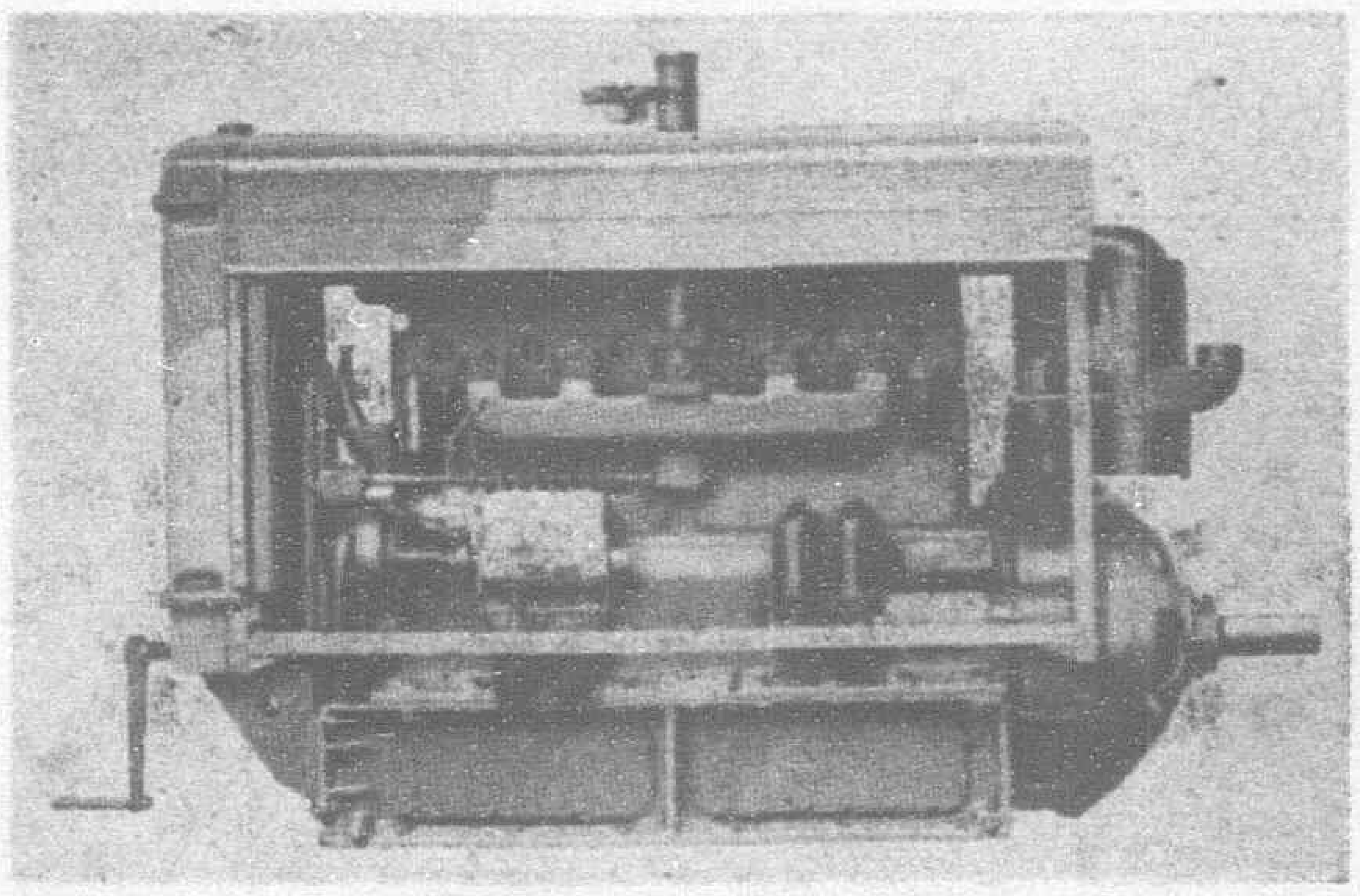


The Waukesha-Hesselman Oil Engine in Section showing: conventional Diesel fuel pump with Hesselman fuel nozzle; magneto and spark plug ignition system; combustion chamber fully machined in the head of the piston; long skirt, four ring pistons with large pin; wet sleeve cylinder liner used in all industrial engines with full length water jacket; submerged gear driven oil pump for full pressure oiling; butterfly throttle in intake manifold; and overhead valves

One of the patented features of the Hesselman engine is the controlling of the fuel-air ratio to insure a readily ignitable mixture at all loads and speeds. The Hesselman throttle is a simple butterfly valve in the main air intake connected to the Waukesha built-in governor or foot or hand accelerator just as it is in a gasoline engine. The air is then metered by this butterfly valve and the amount of fuel is controlled by a vacuum cylinder connected to the fuel pump control rod. This arrangement increases the supply of fuel as the butterfly air throttle is opened and decreases it as it is closed, giving the correct proportion of fuel and air at all times.

Since the only speed controlling device is a simple butterfly valve, a standard Waukesha fly ball governor is used. The governor is built right into the engine, and is the refinement of a basic design going back nearly two decades. It has large pivots and pins, is entirely enclosed, and lubricated by the engine oiling system. Speed adjustments are effected by varying the spring tension, and for vehicle work, a special form of spring mounting is used to provide simple accelerator connections. The Waukesha governor is a major feature of every Waukesha-Hesselman Engine, and is not a minor accessory.

The spring in the fuel injection valve of smaller engines is adjusted to open with an oil pressure of 650 lb. per sq. in. while the larger ones require a pressure of 1,000 lb. per sq. in. This is considered a very low injection pressure, and it is only possible in Waukesha-Hesselman engines because the high air turbulence in the combustion chamber will accomplish a thorough mixing of fuel and air, even at low injection pressures. A fat, hot electric spark ignites the mixture. Moderate injection pressures are desirable because they increase the life of the injection apparatus the same as the moderate combustion and compression pressures increase the life of the engine itself.



Waukesha-Hesselman six-cylinder industrial unit 150-180 horse-power with hand starting crank

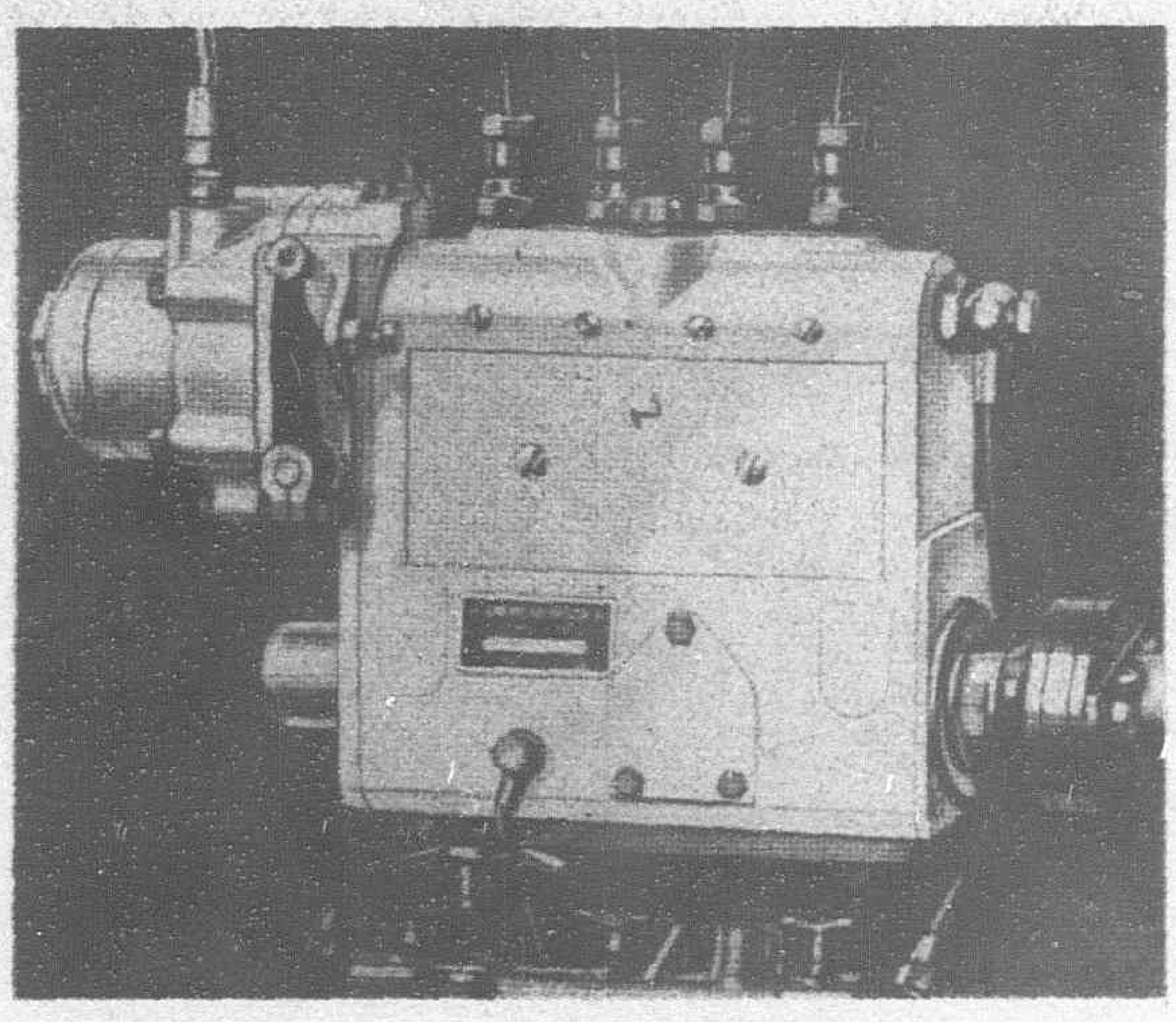
The life of the injection equipment depends to a large extent on the pressures to which it is subjected, and on the grade and cleanliness of the fuel oil used. Careful filtering of the fuel oil as done in the case of the Waukesha-Hesselman engines together with the low injection pressures will give the injection pumps and valves a very maximum of life. Cases are not unusual where Waukesha oil engines have been operated for 10,000 hours or longer without any repairs or difficulty whatever with the injection equipment. No Waukesha-Hesselman nozzle in four years has ever been worn out in normal service.

The Hesselman injection valve is a simple open type nozzle with three half ball check valves to cut off the fuel spray sharply when injection ends, and to prevent combustion pressures from backing into the fuel pressure lines. The nozzle tip is made of Nitralloy stainless steel, and has two large spray holes, one pointing towards the whirling current of turbulent air and the other pointing in the opposite direction. Large spray holes are responsible for the long trouble free life reported by Hesselman engine operators.

Most Hesselman engines are equipped with a conventional diaphragm pump the same as modern gasoline engines which has a glass sediment trap and a fine mesh brass screen in the intake of the pump itself. This first stage takes out the coarse impurities and most of the water. Then this fuel delivery pump forces the oil through a double filter which removes the remaining water and dirt. The primary stage consists of a metallic element with a spacing of one and one-half thousandths of an inch for the oil to pass through. The fine dirt separates from the fuel oil when the oil is forced through these small openings, and deposits on the outside of the cylindrical metal element. There is a rotary knife-edge scraper which scrapes the dirt off the cylinder, and drops it into the bottom of the filter shell when the T-handle projecting from the top of the case is turned. The engine need not be stopped for this operation. Passing the primary element, the fuel oil enters the secondary element where it must filter through a closely woven cloth bag. Any impurities able to pass through the first two filters are caught here, and no foreign bodies that remain in the fuel are large enough to do any damage.

The frequency of cleaning the fuel filter depends on the amount of foreign matter to be removed from the fuel oil. Under all circumstances, the handle of the primary filter element should be given at least one full turn daily. When using an extremely dirty fuel oil, or when the oil is carelessly handled in dusty places, both filter shells should be removed once a week, and the filter elements washed. With clean fuel oils, washing the elements may not be necessary more than once a month.

Standard Hesselman engines operate on practically any clean, refined commercial Diesel fuels. This eliminates crude or bunker oils sometimes used in big bore, slow speed Diesel engines, but any fuel that gives satisfaction in Diesel engines of equivalent size and speed will give equally good results in a Hesselman engine. Fuel oils high in carbon, gum, acid, or sulphur should not be used with either Hesselman or Diesel engines. Fuels too heavy to flow easily at surrounding temperatures or too light to lubricate the injection system should naturally be avoided. In the order of their usual economy from a price standpoint are "domestic furnace oils" Nos. 3 or 2, and commercial "high speed Diesel fuels." Kerosenes and distillates can be used if their deficiency in lubricating properties is made up by the addition of three to five per cent of light engine lubricating oil. Gasoline could also be used *in emergencies* by mixing it with lubricating oil. The practical significance of the fuel requirements of the Hesselman



Standard four-cylinder American Bosch fuel injection pump with vacuum control for Hesselman engines

engine is that suitable fuels may be found wherever high speed Diesels are in use, and in many old corners of the world where only kerosenes and distillates are available.

The Hesselman is easier to start than a gasoline engine of the same size under the same circumstances. Due to its low compression, it is possible to use a priming charge of gasoline without any special complicated mechanism to lower the compression or convert it, for starting, into a gasoline engine. With two or three strokes of an ordinary primer which injects a spray of gasoline into the air intake manifold, and electric ignition to ignite the priming charge, these engines, even cranked slowly by hand, will fire on the first or second revolution. As soon as the engine fires, it begins to function on fuel oil; and even in the coldest weather a Hesselman engine requires no more priming nor any longer warming period than its gasoline counterpart under similar conditions.

The saving possible by the use of fuel oil in Hesselman engines will vary, depending on the kind of service. In some places Ingersoll-Rand has found that air compressors driven by Hesselman engines cost half as much to operate as the same units driven by gasoline engines. In other places, the savings are slightly more than this, and in others, slightly less. A fully loaded Stewart Model 48 truck in a cross country test through the Rocky Mountains showed economies ranging between 9½ and 12¼ miles per gallon depending on the altitude and grade. Another road test of a small speed wagon powered by a 25 h.p. four-cylinder Hesselman engine, showed a fuel consumption of 25 miles to the gallon or better, which was the equivalent of 150 ton-miles per gallon of fuel oil. Published performance curves show economies ranging between 0.51 and 0.56 pounds of fuel per brake horse-power hour under full load, with greater economies at three-quarter load ranging from 0.48 to 0.52 pounds of fuel per horse-power hour. This is slightly more than the fuel consumption commonly claimed for compression ignition Diesel engines, and considerably better than the fuel consumption with most gasoline engines.

Both fuel oil and gasoline are purchased by the gallon, but the engineers' way of expressing fuel consumption is in pounds of fuel per brake horse-power per hour. Some highly efficient gasoline engines will show the same consumption in pounds of fuel as Hesselman engines, but the greater weight per gallon of fuel oil—20 per cent to 40 per cent—means that less gallons are required, so that the Hesselman fuel bill would be 20 per cent to 40 per cent less even though the price per gallon of fuel oil and gasoline were the same.

Hesselman engines, because of the low pressures—the same pressures both in compression and combustion as commonly found in modern gasoline engines—are extremely easy on bearings, rings, pistons, cylinders, gaskets, and valves—in fact about the same as a gasoline engine. In addition to low maintenance expense, reliability is improved. The low pressures are easier to maintain than high pressures, so that Hesselman engines do not lose so much in power or efficiency as wear takes place, and their mechanical condition runs down. When they are new, they may use more fuel than a compression ignition Diesel engine, but probably over their entire life between overhauls, it would be hard to find any difference. Certainly in the hands of the "common labor" operator, the advantage of the low pressures employed would favor the Hesselman engine.

Hesselman engines are lubricated by a full pressure circulating oiling system which feeds oil under pressure to all the shafts, bearings, and gears within the engine. Oil mist created by the throw-off from the crankshaft lubricates the cylinders and piston. A special filter which originated in the Waukesha laboratories is most effective removing the carbon and reducing the sludge common in all oil engines. This adds greatly to the useful life of the oil itself and thereby reduces the operating cost. This filter is unique in that it does not require the use of any hard-to-procure special filter element. It employs ordinary white cotton waste which is packed into a perforated steel shell, and through which the oil passes. The sludge and dirt cling to the waste, and the clear oil is returned to the crankcase. This element can be renewed anywhere in the world, as cotton wiping waste is used wherever machinery is found.

The smallest Waukesha-Hesselman engine is a four-cylinder engine with a piston displacement of 210 cubic inches and a horse-power rating of 20-30 h.p. From this size, they progress in four-cylinder models, to one with 1,060 cubic inches displacement rated at 100-115 horse-power. Six-cylinder sizes range from a small six of 282 cubic inch displacement rated at 60-75 horse-power to a 2,900 cubic inch engine with an output of 300 horse-power.

The Hesselman engine has been built by the Waukesha Motor Company since October 10, 1931. Originally it was made for Ingersoll-Rand portable compressors. Since then thousands have been sold, and they are now successfully used for operating air compressors, shovels, hoists, cranes, pumps, electric generators, trucks, tractors, marine propulsion and auxiliaries, and in fact every type of heavy duty in which Waukesha gasoline engines have been used in the past. Many models have mountings that permit interchangeability between Hesselman engines and gasoline engines with the same horse-power ratings. This is a great convenience to builders of power-driven machinery.

Owing to the fact that the Hesselman engine is not a high pressure engine, many of its parts are interchangeable with gasoline engines of the same size and, accordingly, the weight is very little more than its gasoline counterpart. In most cases 50-100 pounds would be the total difference, and this is represented by the weight of the fuel injection system.

The Waukesha Motor Company factory and laboratory are located at Waukesha, Wisconsin, a suburb of Milwaukee, and are open for visitors on any working day. A cordial invitation is extended to everyone interested in internal combustion engines to visit this plant and see these engines being built and tested. The plant covers more than ten acres of active manufacturing space with the largest research and development laboratories devoted exclusively to heavy duty automotive and industrial engine problems in the industry.

The Dredger "Chien She"

(Continued from page 441)

dumping area, about two miles distant from the dredging cut, in a total time of 2,271 working hours, resulting in a deepening of the channel of about 3-ft. over a width of 600-ft. and a distance of three miles.

This remarkable achievement is considered highly satisfactory, in view of the fact that over 60 per cent of the output consisted of hard sand, which is not only difficult to dredge, but quickly settles in the mixture, resulting in a low average hopper density.

The situation of the line of dredging is shown on the chart of the Yangtze Estuary.

Particulars of the Five Largest Dredgers

The table (see p. 441) gives the principal characteristics of five of the largest Bar dredgers now in operation, from which it will be seen that the dredger *Chien She* is the largest and most powerful of the drag-suction type which has yet been constructed.

Soviet Engineering Industry in 1937

By L. BERRI in The Monthly Bulletin of the U.S.S.R. Chamber of Commerce

THE Soviet engineering industry has made notable progress in 1936. The output of all the metalworking industry has gone up 41 per cent. The plan for 1936 and the program for 1937 set by the second five-year plan have been overfulfilled. In comparison with 1935 the output of motor lorries increased in 1936 by 70.8 per cent, steam boilers (in enterprises under heavy industry) by 49.5 per cent, Diesel engines by 36.5 per cent, metal-cutting machine tools by 19.3 per cent, dredgers by 32.9 per cent and so on.

Besides a growth in volume the engineering industry has to its credit important achievements in the matter of range of its manufactures. Proof can be found in any branch of the engineering industry. The works manufacturing machine tools organized production of many complicated machines in 1936, including a longitudinal milling machine for Metro tubings, a combined aggregate drilling machine for the motor-car industry (eight-hole drilling) and others. The program set by the second five-year plan for organizing production of new types of metal-cutting machines was carried out in 1936 before schedule. Altogether two hundred type-sizes of machine tools were mastered during the four years of the second plan. Headway has also been made in 1936 in organizing production of heavy equipment. Thus, production was organized of complex sheet mills, cold rolling mills, slabbings, lift cages, powerful ore crushers, heavy dredgers, etc. New types of machines have been mastered in the electrical engineering industry. Production of a new model motor-car—*M-1*, etc., was started in the automobile industry.

Soviet engineers have independently tackled and solved important technical problems. The production of locomotives with a tender-condenser, serial production of single-flow boilers of professor Ramzin's system, the construction of a huge propeller-pump for the Volga-Moscow canal and numerous other feats of engineering are indisputable testimonials to the progress of the Soviet engineering industry and the skill of Soviet engineers and workers.

Progress in the output of the engineering industry in 1936 was achieved as a result of a considerable rise in labor productivity which testifies incidentally to the advancement in technical efficiency. Labor productivity in the metalworking industry registered an increase of 24.4 per cent in 1936 as compared with 1935. The engineering industry in 1936 overfulfilled the program set by the second five-year plan for reducing costs, although there is still much to be done in the way of economizing metal and reducing the amount of rejects. Hence it follows that there are considerable potentialities for lowering costs still further.

In 1937 the engineering industry—that main branch of the national economy—is to take another important stride forward both in respect of the volume of output and the quality and range of the machines produced. The plan for 1937 for the whole metalworking industry, which besides engineering includes the manufacture of metal goods, calls for a 23 per cent increase of production. The total output of the metalworking industry in 1937 will amount to the vast sum of 30.3 milliard roubles. A still higher rate of increase is provided for in the case of numerous types of machines. An idea of this progress can be gained from the following table giving several items.

GROWTH OF OUTPUT*

	1932	*1936*	*1937*
Steam boilers, thous. sq. m.	115.8	168.2	289.3
Turbines, thous. kw.	314	1,070	2,170
Automobiles, thous.	23.9	136.5	220
Tractors, million h.p.	0.7	2.6	2.6
Harv. combines, thous.	10	42.5	55
Locomotives (E. and SU. equiv.)	828	1,567	1,900
Freight cars (2-axle equiv.) thousand	17.6	67.2	86
Metal-cutting machines thousand	18.9	28.8†	41

*1932 and 1936 are actual and 1937 planned figures.
†Excluding R.S.F.S.R. local industry.

A comparison with 1932 shows the striking successes of the Soviet engineering industry during the period of the second five-year plan. The output of such important machines as those enumerated in the above table is seen to have increased several times over and in some cases as much as five to tenfold (combines, turbines, automobiles and freight cars).

The plan for 1937 in the engineering industry provides for a further rise in the level of mechanization in all branches of the national economy and ensures the consummation of the process of technical reconstruction of the whole economic system.

The development of the automobile and tractor industry in 1937 should ensure the continued expansion of motor facilities in the Soviet Union and the mechanization of agriculture and the timber industry. The output of gas generator and Diesel engine lorries is to be increased in 1937. Twenty-five thousand passenger automobiles of the *M-1* and *ZIS-101* models are to be produced. More powerful tractors will be turned out and will find more extensive application in agriculture and the timber industry with the manufacture of various kinds of accessories and trailers.

The plan for 1937 calls for an adequate supply of rolling stock for the railways, special attention being given to the increased production of passenger locomotives and passenger cars. Only four-axle large capacity freight cars, besides special tank cars, will be manufactured in 1937. Large capacity freight cars will constitute 98.8 per cent of all freight cars produced for the railways. More powerful locomotives of the *SO* series will entirely replace the production of *E* series. The output of passenger locomotives and passenger cars is to register a particularly strong increase (more than threefold and twofold respectively). More locomotives with tender-condensers are to be turned out in 1937—510 against 53 in 1936. One hundred *IS* series super-power locomotives are to be built in 1937.

The development of the country's electrical economy calls for an increase in production of power installation. The output of turbines, Diesel engines and generators in 1937 is to increase in capacity about twofold compared with 1936; that of locomobiles is to increase more than twofold; steam boilers by 60 per cent (in capacity). The first two steam turbines of 100,000 kw. capacity each, as well as 100 atmosphere high pressure steam boilers and 29 atmosphere bleeder turbines are to be built in 1937. New types of electrical plant are to be put into production, including a 36 kilovolt turbine generator, a 220 thousand kva transformer and others. Special attention is to be given to the manufacture of small turbines and generators for local electric stations. Thus the output of generators of up to 100 kw. capacity is to reach 4,000 against 1,500 produced in 1936.

The extended production of farming machinery will stimulate the further mechanization of agriculture. The second five-year plan's program for 1937 in respect of agricultural machinery production is to be doubled. The output of tractor-drawn ploughs is to increase nearly twofold in comparison with the previous year (from 82.3 to 151 thousand), that of mechanical traction cultivators 2½ fold (from 50.2 to 127.2 thousand), tractor seeders almost twofold (from 72.5 to 136.2 thousand) and so on. Many new types of agricultural machines will be mastered in 1937.

The plan for 1937 calls for a considerable expansion in the output of mechanical labor-saving devices for the building trade, roadmaking, the mining industry, etc. Building and roadmaking equipment is to increase both in volume and denominations and is to include new items such as motor-mounted excavators, new types of multiple-scoop excavators, graders, motor rollers, etc. The production of tractor-crane equipment is also to be extended.

An important increase is provided for in the output of textile machinery. The capacity of textile engineering works in 1937 is to be doubled. A particularly high rate of development is planned in the output of spinning and preparing machinery for the cotton and flax manufacturing industries; new complex types of textile machines will be introduced and high-speed automatic weaving and spinning machines will be designed.

Production of machinery for the food industry is also to be greatly extended. An important factor, besides increased volume of output, is the introduction of the latest types of automatic equipment. Over 100 new types of machines are to be mastered by the specialized food-machinery plants. The manufacture of complete equipment for tin-can automatic lines is to be organized in 1937. Machines are to be made for the mechanical production of bread rolls, buns, etc., and automatic doughnut machines are to be introduced. As regards confectionery equipment, biscuit packing machines, automatic sweet filling machines and others are to be mastered.

The machine tool industry is planned to show a vigorous development. The second five-year plan will be overfulfilled in 1937 both in respect of the quantity of machine tools produced and number of type-sizes mastered. The production of 160 type-sizes of new machine tools will be organized in 1937. In comparison with 1936 the highest rate of increase in production will be shown in respect of polishing machines, tooth-cutting, automatic and semi-automatic machines, that is to say of machine tools of the most complex and efficient kind. The task of providing the reconstructed automobile works with special kinds of efficient machine tools undertaken in 1935 necessitated a considerable amount of experimental work and designing, which have raised the standard of Soviet machine tool engineering. The fruits of this activity were already in evidence in 1936 and will permit the production of new and efficient types of machine tools to be set up on broad lines in 1937. Aggregate machines, special boring lathes, multiple-spindle boring and thread machines and other special machine tools will be turned out in 1937 in mass production for the automobile and other industries. High-speed turning lathes with 3,000 and 5,000 revolutions per minute, high-speed turret lathes, etc., will be produced in 1937. The production of new types of milling, tooth-cutting, turning and polishing machines will also be mastered, particularly new models of non-center internal polishing machines, special grinding machines, etc. The development of machine tool and instrumental engineering is a vital factor in the continued progress of labor productivity and improved quality of the goods turned out by the engineering industry.

The successes of Soviet engineering, expressed in the growing volume of output and range of manufactured machines, are inseparably bound up with technical progress. Technical progress in the engineering industry in 1937 is to follow the line of revising designs, introducing welding on a larger scale, economizing metal, employing new metals (alloyed steels), etc., etc.

In addition to mastering advanced modern technique the Soviet engineering industry in 1937 is to make further progress in labor efficiency, in improving the quality of machines and cutting down expenditure of metal.

Capital construction in 1937 is to bring about a considerable increase in output capacities in the automobile, rolling stock and textile machinery industries. Large investments are to be made also in machine tool production, Diesel engine manufacture and other branches of the engineering industry.

The volume of machine production is to reach a formidable figure in 1937. The U.S.S.R. to-day is the leading country in Europe in respect of engineering industry output.

The successful fulfilment of the 1937 plan will create the conditions necessary for the further vigorous development of all branches of the national economy.

Soviet Heavy Industry in 1936

By A. ZERENINOV in The Monthly Bulletin of the U.S.S.R. Chamber of Commerce

THE output of entire big industry in the Soviet Union in 1936 increased to 80.8 milliard roubles, from 62 milliard roubles in 1935, which is a rise of 30 per cent or 18.8 milliard roubles. The dimensions of this increase are very great indeed. It is sufficient to say that the entire output of big industry in tsarist Russia in 1913 amounted to 10,250 million roubles, i.e., it was practically half the growth of production for 1936.*

The leading place in the volume and rate of this increase in 1936 is held, as in former years, by industry under the management of the People's Commissariat for Heavy Industry. The gross production of this Department is shown in comparison with 1935:

GROSS PRODUCTION OF HEAVY INDUSTRY

(in million roubles)

1935	*1936*	*Percentage of increase*
24,857	33,093	33.1

The yearly plan for the whole of heavy industry in 1936 was overfulfilled by 5.5 per cent. It is important to mention that heavy industry developed in 1936, as well as in all the years of the second five-year plan, at a much faster rate than was provided for in the five-year plan.

YEARLY RATE OF INCREASE

(in percentage of previous year)

Year	*Per second five-year plan*	*Actual fulfilment*
1933	8.8	10.8
1934	24.3	27.7
1935	17.8	27.0
1936	21.0	33.1

Gross production under the five-year plan in heavy industry was to have amounted to 32.6 milliard roubles in 1937, whereas the actual fulfilment in 1936 amounted to 33.1 milliard roubles. Thus, the program set for all heavy industry under the second five-year plan has been completed in four years instead of five. It is characteristic that the highest rate of increase in output became more evident in 1936 than in any other period of the second five-year plan. This fact eloquently corroborates the words of com. Stalin, uttered on the eve of the second five-year plan, to the effect that "we will be able, say, towards the latter half of the second five-year plan, to make a fresh powerful spurt forward in the sphere of construction as well as in the sphere of increasing industrial output."

Technical norms and designed capacities were subject to revision in the course of 1936 in all branches of the heavy industry on the basis of the widespread Stakhanov movement. The struggle to achieve these new technical norms and to completely master technique, which took the new higher form of socialist emulation symbolized by the nationwide Stakhanov movement, was responsible for the high rate of increase in the output of heavy industry which was attained in 1936.

The production of the principal manufactures of heavy industry in 1936 can be seen from the table opposite.

The lead in heavy industry is retained by engineering, whose output has registered a heavy increase of 40.8 per cent, the growth for 1936 in absolute figures being nearly five milliard roubles. The relative importance of the engineering industry in heavy industry as a whole rose to 51 per cent in 1936, and was 21.5 per cent in relation to the total output of big industry. The second five-year plan in the engineering industry has been completed in four years to the extent of 120 per cent.

OUTPUT OF PRINCIPAL INDUSTRIES

Industry	*Unit*	*1935*	*1936*	*Percentage of 1935*
Electric power generated by Commissariat's district stations	million kwh.	18,163.8	22,783	125.4
Engineering, U.S.S.R.	million rubl.	12,960	18,276	141.0
incl. Commissariat's ..	,, ,,	12,026	16,932	140.8
Coal mining, Total U.S.S.R. ..	,, tons	106.6	123.7	116.0
incl. Commissariat's ..	,, ,,	101.1	116.8	115.5
Petroleum and gas	,, ,,	26.8	29.2	109.1
Coking	,, ,,	16.7	19.9	118.7
Iron ore mining..	,, ,,	27.1	27.9	102.9
Pig iron	,, ,,	12.5	14.4	115.3
Steel	,, ,,	12.5	16.3	130.4
Rolled metal	,, ,,	9.4	12.5	132.1
Motor trucks	number	77,742	132,917	171.6
Tractors	,,	113,237	115,608	102.1
Locomotives, conv. series E. ..	,,	1,807	1,567	86.7
Freight cars (2-axle equiv.) ..	,,	90,760	75,864	83.6
Harvester combines	,,	20,169	42,545	210.9
Machine tools, Commissariat's .	,,	19,378	23,769	122.7
Turbine-generators	kw.	425,500	503,500	118.3

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*Here and elsewhere industrial output is shown in fixed prices of 1926-27.

The development of the Soviet engineering industry, however, was not only a quantitative one. This growth was attended by a steady mastery of various new machines and designs.

One of the most important achievements in the Soviet Union's power industry was the elaboration and production of new types of single-flow boilers of Professor Ramzin's system. These boilers are extremely efficient and are conspicuously economical in comparison with the leading foreign makes of high pressure boilers. The single-flow boilers require three times less metal per unit of boiler capacity. Serial production of these boilers (with a pressure of 140 atm.) was started at the end of 1936.

The power industry works have mastered and are producing for the first time such items as boosters (the *Electrozavod* in Moscow), new series of turbine-generators (*Electrosila* works), dozens of different types of relays (Kharkov Electrical Engineering Works), new types of electric welding units and electric furnaces for metallurgy, including induction furnaces (*Elektrik* works), new specimens of oil switches, electric equipment for the first super-powerful icebreaker, sluice installation for the Volga-Moscow Canal, core-drills for collieries and numerous other electric machines and apparatus.

The achievements of the electrical engineering industry which has mastered the production of new powerful plant, super power transformers and turbines and mercury vapor rectifiers, etc., render it possible to build a new and more economical type of electric stations which will tend to place the country's electrical economy on a still higher technical level.

The automobile industry has started to turn out comfortable and elegant passenger cars—the five-seater *M-1* manufactured by the Gorki works and the seven-seater *ZIS—101* manufactured by the Stalin works, Moscow.

Important changes have taken place in the range of goods produced by the transport equipment plants. The super-power *FD*, *IS* and *SO* locomotives are now being turned out in mass production ; locomotives with tender-condensers which are of vital importance for traversing waterless localities were also produced in 1936, as well as Diesel engines and trunk line electric locomotives ; the production of special types of cars, including dump-cars, four-axle gondola and truck cars, etc., has also sharply increased.

The machine tool industry has organized the production during the second five-year plan of 243 new type/sizes of intricate machine tools. Eighty-four type/sizes of new machine tools were mastered in 1936 alone. Special mention should be made of a highly efficient turning and drilling vertical automatic machine (*Krasny Proletari* works), a flat-polishing vertical spindle lathe for ball-bearing factories (*Samotochka* works), a group of four-spindle automatic machines (Orjonikidze works), a highly efficient tooth-milling machine (*Komsomolets* works), various special aggregate-drilling machines for tubing work and for the automobile and tractor industry, etc.

The agricultural machnery works, have supplied the collective and state farms of the country with quite a number of new and important types of machines. In addition to the usual types of ploughs, seeders, mowers, harrows, etc., the farming machinery industry of the Soviet Union is turning out large quantities of special machines, such as : cotton, beetfield and vegetable tractor seeders (of which 15,632 were manufactured in 1936) ; tractor and miscellaneous cultivators (50,186 produced in 1936) ; beet lifters (7,225 produced in 1936) ; tobacco-planting machines, forest planting machines, potato tractor earthing machines, wide range flax scutchers, mowing machines, potato harvesting machines, flax and herb threshers, wind-motors, special Northern combines, etc. The production of all kinds of combines in 1936 was more than double that scheduled under the second five-year plan—42,500 being produced against 20,000 set by the plan.

Dozens of new machines and apparatus were produced for the peat industry (baggers, peat-suction cranes, froth cocks, ditchers, etc.), the paper, timber, woodworking and food industries.

The heavy engineering works are now manufacturing grizzly coke screens, Brozius guns, Ottis winches, new loading apparatus, burners, mixers, rolling mills and tube-rolling mills, powerful presses and compressors, cranes, crushers, agglomerating equipment, etc. The manufactures of the Soviet Union's heavy engineering industry could now be listed in a voluminous catalogue.

Industry is also producing a number of new precision measuring instruments and appliances for automobile, aviation and other requirements.

The output of the chemical industry under the People's Commissariat for Heavy Industry registered a growth of 32.8 per cent in 1936 compared with 1935. In synthetic rubber production—that remarkable new field of industry in which the Soviet Union is the pioneer—there has been an increase of nearly twofold (by 94.8 per cent).

There has also been a considerable increase in the production of non-ferrous metals, notably copper and aluminium ; the output of zinc and lead has likewise sharply increased ; nickel works have been started, and so on. The U.S.S.R. has advanced to second place in world gold production.

The capacity of 19 hydro-electric stations under *Glavenergo* reached 942.5 thousand kw. on January 1, 1937 : a particularly large increase in capacity was registered by the central electric heating stations, from 157,000 kw. on January 1, 1933 to 430,000 kw. The thermal production comprised five million mega-calories in 1936 (29.8 per cent more than in 1935), while the length of general service network alone increased by January 1, 1937 to 185 kilometers.

Considerable progress has been made in mechanical coal mining. Mechanical mining in the Donets Basin accounted for 88 per cent of production in 1936, in the Kuznetsk Basin 94.9 per cent and in Karaganda 84.7 per cent. Coal hewing was mechanized in the Donets Basin to the extent of 88.6 per cent, in the Kuznetsk Basin—92.1 per cent and Karaganda—92.1 per cent. Haulage was mechanized in 1936 to the extent of 90.3 per cent in the Donets Basin, 85.1 per cent in the Kuznetsk Basin and 84 per cent in Karaganda.

Oil drilling in the petroleum industry has gone up sharply. Drilling distance in 1936 amounted to 2.1 million meters against 1.5 million in 1935—an increase of 40.6 per cent. The speed of work as well as prospecting drilling registered also a considerable increase ; drilling speed increased on the average by 84.5 per cent over 1935.

The mean drilling speed at the beginning of the second five-year plan equalled 108 meters per drill/month, that of work drilling being 149 meters. Under the second five-year plan total drilling speed was to have been increased to 300 meters by 1937, but already in the fourth quarter of 1936 drilling speed had attained 488 meters, that of work drilling being 707 meters.

Consequently, in this industry as well the program of the second five-year plan has already been overfulfilled.

The refining of crude oil rose from 85.5 per cent in 1935 to 90.63 per cent in 1936, and there was an improvement in the yield of benzine and cracking benzine. Production in the new oilfields is making remarkable progress. While the total oil production has increased on the average by 9.1 per cent, that of the Emba oilfields (northeastern shore of the Caspian Sea) has increased by 72.5 per cent, and in the Bashkir republic by 138.4 per cent, i.e., nearly 2½-fold.

There has been a very substantial increase in 1936 in the production of peat by the milling process, which exceeded that of 1935 by 57.4 per cent. The total production of peat in 1936 amounted to 13.6 million tons.

Owing to its rapid industrial development the Soviet Union has securely won a leading place in European and world production.

SOVIET UNION'S PLACE IN PRODUCTION

Item	*World*	*Europe*
Gross production of industry	2nd	1st
Engineering	2nd	1st
Agricultural machinery	2nd	1st
Tractors (in h.p.)	1st	1st
Harvesting combines	1st	1st
Electric power	3rd	2nd
Coal	4th	3rd
Petroleum	2nd	1st
Pig iron	3rd	2nd
Steel	3rd	2nd

New enterprises and units have been put into operation in 1936 to a sum of 7.7 milliard roubles. We give here a short list of only the chief enterprises started in 1936 :

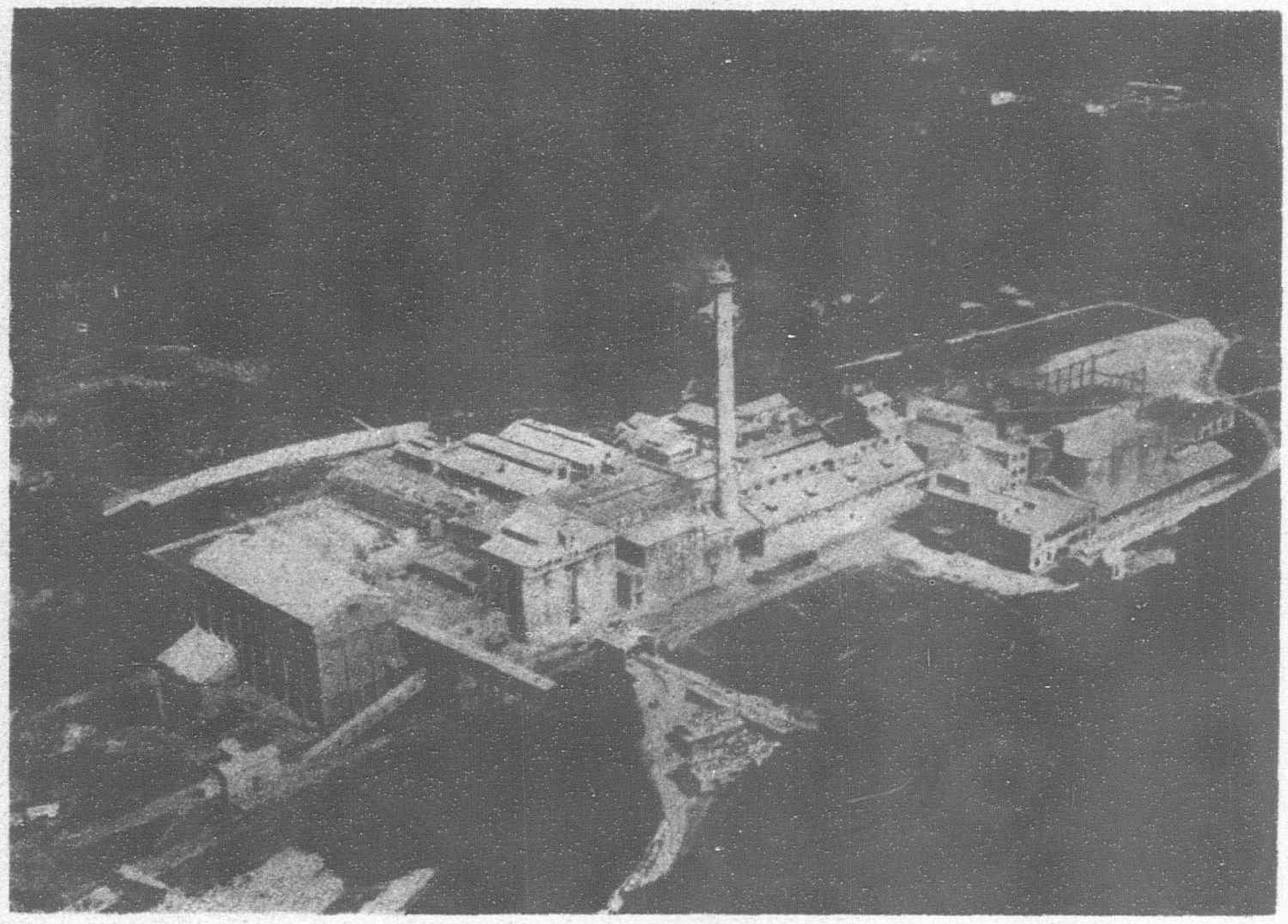
Electric stations with a total capacity of 687 thousand kw. ; electric transmission lines totalling 1,116 km ; 18 coal pits with total yearly output of 5,750,000 tons of coal ; nine iron ore mines with a total yearly output of 2,420,000 tons of ore ; several concentration mills ; five cracking plants with a capacity of 670 thousand

(Continued on page 455)

Japan's Cement Industry[*]

THE production of cement in Japan was first undertaken by the Government as early as 1871, when the Civil Engineering Department of the Home Ministry established a cement factory. This Government factory was however bought out twelve years later, i.e. in 1883, by the late Mr. Soichiro Asano, President of the Asano Cement Factory and the Toyo Kisen Kaisha. Concurrent with the development of industries in general, this particular branch has made steady progress until it ranks at the present day as one of the important industries of the country.

Until the middle of the Meiji Era (about 1889) cement was still imported, but as a result of the rapid progress witnessed in the Japanese industry since the beginning of the Taisho Era (about 1912), foreign-made cement was completely driven out of the country, and at the present day Japan exports in fact as much as 3,000,000 barrels annually. With the annual output (1934) being set at about five million tons, Japan ranks next to the U.S.A. and Great Britain as regards volume of production. The initial progress made by the industry was mainly due to the demand for cement for railway construction, and further development was observed after the Russo-Japanese War. The demand became still further accelerated by the World War and the reconstruction work following the disastrous quake-fire in 1923.



Aerial view of the Nishitama Factory

Cement made in Japan is of the Portland variety, and the raw materials for its manufacture, e.g. limestone and clay, are found everywhere in Japan in abundance. Most of the cement produced is consumed within the country, which no longer depends upon imports.

The manufacture of cement does not require much skilled labor, but necessitates a large outlay for comprehensive plants, especially as cement-making machinery is being improved with exceptional rapidity as to necessitate important innovations about every five years. Not being easy to store, a considerable outlay has to be made on adequate arrangements for storage. As a lack of balance between demand and supply will easily upset the market, resulting in intense competition among the makers, the industry has come to be monopolized by only a small number of firms, which accounts for the efficient control exercised over the industry.

Although the output has been consistently showing an upward trend in keeping with the growth of demand, curtailment of production has been found necessary since the year 1924, due to the expansion of cement-making plants being beyond the limits of requirements. The highest production figure was attained in 1929, which however dwindled rapidly on account of the depression which prevailed in the following two years. There was again a sharp turn towards an increase from 1932, when public works for the relief of the distressed agrarian communities, etc., were put in hand.

It is of frequent occurrence after a boom that, on account of improvements effected in working operations and the erection of new plants, the productive capacity shows an increase beyond the limit of actual demand. The production capacity increased from five million tons in 1929 to 7,840,000 tons in 1933 and to 9,560,000 tons in the year 1934. This expansion gravely disturbed the balance between demand and supply and created a situation making the control of production imperative. Accordingly curtailment has been enforced since the organization of the Cement Manufacturers' Association in October, 1924, the present volume of production being about half the capacity, or about 4,790,000 tons in 1934.

PRODUCTION CAPACITY AND ACTUAL OUTPUT

(In 1,000 metric tons)

	1929	*1930*	*1931*	*1932*	*1933*	*1934*
Production Capacity ..	5,004	5,805	6,365	6,750	7,835	9,562
Actual Output.. ..	4,349	3,748	3,615	3,731	4,781	4,790

Continual Increase in Consumption

During the past twenty years the demand for cement has increased continually at a regular rate of from 10 per cent to 15 per cent, but declined to a marked extent in 1930 and 1931 on account of the world-wide depression and the Government retrenchment policy. The renewal of the gold embargo, coupled with emergency relief works undertaken by the Government, had a most beneficial effect in increasing consumption, in addition to which the general industrial prosperity and extensive building operations in Manchoukuo must be mentioned as favorable factors. Exports, which had hitherto been about 10 per cent of the total demand, increased considerably due to requirements in Manchoukuo.

Statistics compiled by the Cement Manufacturers' Association show that 60 per cent of the cement manufactured is used for public works and building purposes, while that for the manufacture of artificial stone, slates, pipes and tiles is only about three per cent.

CEMENT DELIVERIES *(in 1,000 metric tons)*

	1926-1928 (average)	*1929*	*1931*	*1932*	*1933*	*1934*
Total deliveries ..	3,550	4,150	3,618	3,791	4,749	4,713
Home market ..	3,181	3,666	3,076	3,322	3,981	3,887
Foreign markets .	336	447	520	443	721	766

CLASSIFICATION OF USE IN HOME MARKET

(in 1,000 metric tons)

	1932		*1933*		*1934*	
		%		%		%
Retails	1,173.2	35.3	1,226.6	30.8	1,379.5	35.5
Buildings in general ..	685.8	20.7	927.2	23.3	954.7	24.6
Public works	355.4	10.7	445.8	11.2	353.9	9.1
Roads and bridges ..	426.7	12.8	488.2	12.3	326.8	8.4
Railways	321.9	9.7	364.5	9.1	305.5	7.9
Electric power ..	115.3	3.5	159.0	4.0	226.6	5.8
Harbors	114.5	3.4	202.1	5.1	138.8	3.6
Cement manufactures.	78.3	2.4	100.6	2.5	125.3	3.2
Mining	30.3	0.9	47.2	1.2	59.5	1.5
Other purposes ..	20.0	0.6	20.2	0.5	16.4	0.4
Total	3,321.4	100.0	3,981.4	100.0	3,887.0	100.0

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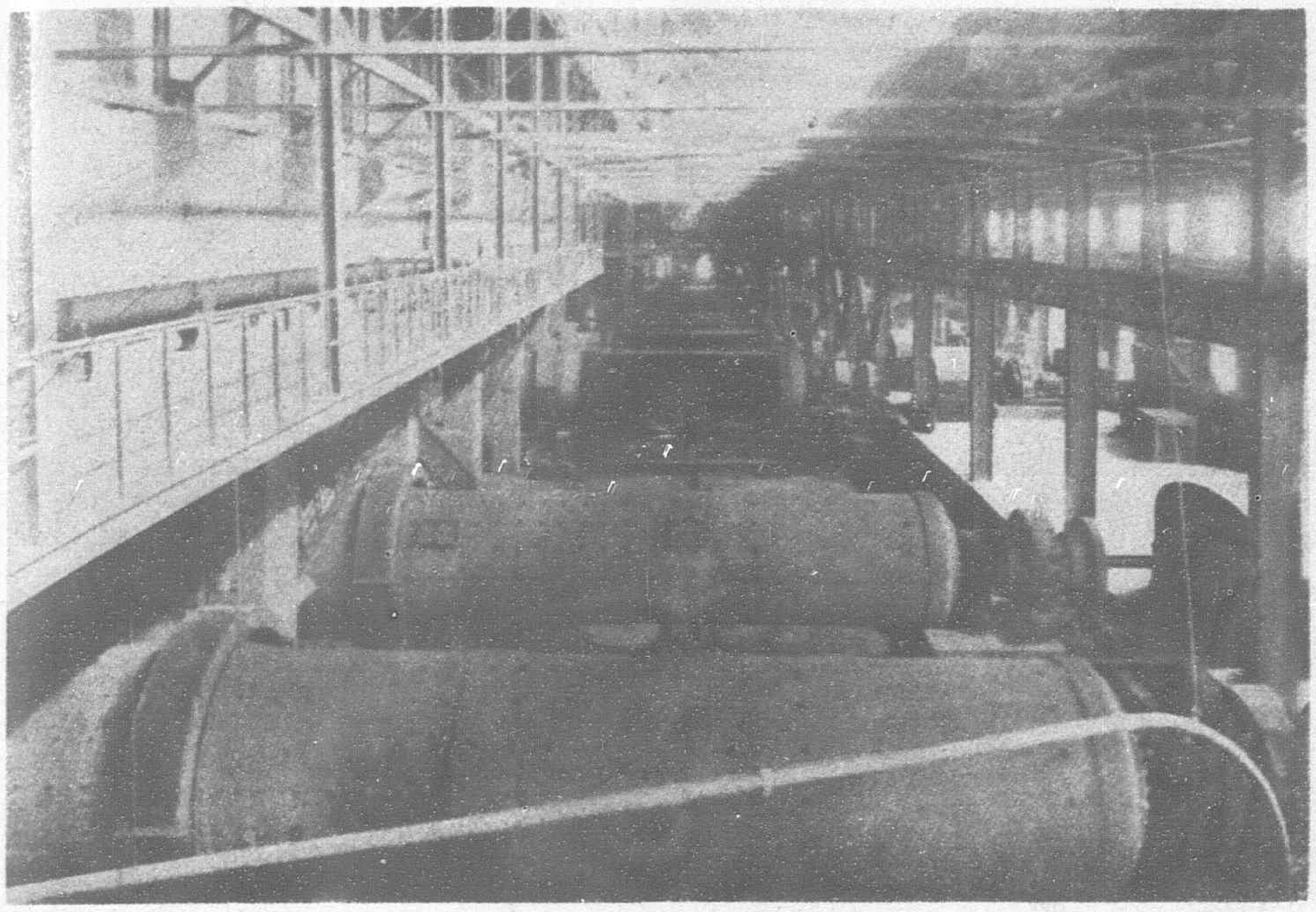
[*] *Japan Trade Review.*



Japanese Cement mills

As previously stated, the activity of the cement industry since the latter part of 1932 has been due to public works, the industrial expansion of the past few years and the sharp increase of exports in connection with new construction in Manchoukuo. Of these factors, the emergency relief works have already been completed, and owing to the annual expansion of national defence expenditure, there is little hope for further extension. It is also considered unlikely that industrial activity will stimulate the demand for cement in the near future.

The cement industry continued prosperous in 1934 due to increased demands from numerous Government works for rehabilitating districts damaged by storms and other calamities. The total shipments from plants for domestic consumption reached 3,886,000 metric tons, a decrease of about 90,000 tons from the figures for the previous year, which stood at 3,977,000 tons. This decrease in shipments by manufacturers forming the Japan Cement Makers' Association does not however mean a reduction in the total domestic consumption, as the said decline was caused by the production of more than 30,000 tons monthly by outside manufacturers (the Nitto, Hinode, Kyushu Sangyo, and Taihei Companies). It will thus be seen that reduction in production by the Associated companies was thus caused by the production of outsiders.

On the other hand, the shipments to Manchoukuo advanced to 437,000 tons in 1934 from 313,000 in the previous year. These shipments are expected however, to decline in future, as manufacturing facilities in Manchoukuo will become improved very shortly.

Leading Foreign Buyers of Japanese Cement

Formerly the demand for cement was mainly for home requirements, only about 10 per cent of the total output being exported. In later years, however, due to the expansion of manufacturing capacity, cement has been shipped to foreign countries in larger volume, and now occupies an important position in the list of export articles.

Exports reached the highest level in 1919 and 1920, but gradually dwindled during subsequent years, recovering, however, in 1925. As output curtailment does not affect the production intended for export, manufacturers naturally endeavor to push overseas shipments, with the result that new markets have been developed in the Netherlands East Indies, Hongkong, Straits Settlements, British India, etc. The renewal of the gold embargo in 1931 and the consequent depreciation of Japanese currency favored the export trade appreciably, but obstacles set in later in the shape of high tariffs and other measures aimed at checking Japanese goods. Such being the case the field for exportation has been narrowed considerably, and the volume of exports has decreased. Above all the restrictions imposed on Japanese goods by the Netherlands East Indies in June 1933, dealt a severe blow on the Japanese cement industry, especially as that country was a great consumer of the Japanese product. However, the sharp increase of shipments to Manchoukuo and Soviet Russia more than compensated the loss in other foreign markets.

Problem of Manchoukuo Market

As already stated, the export of cement to Manchoukuo advanced to 437,000 tons in 1934, an increase of 124,000 tons over the previous year. While the demand in Manchoukuo is expected to increase rapidly in the near future, new cement companies in Manchoukuo commenced operations at the end of 1934, and that is why the prospect of future shipments to Manchoukuo is regarded as very gloomy.

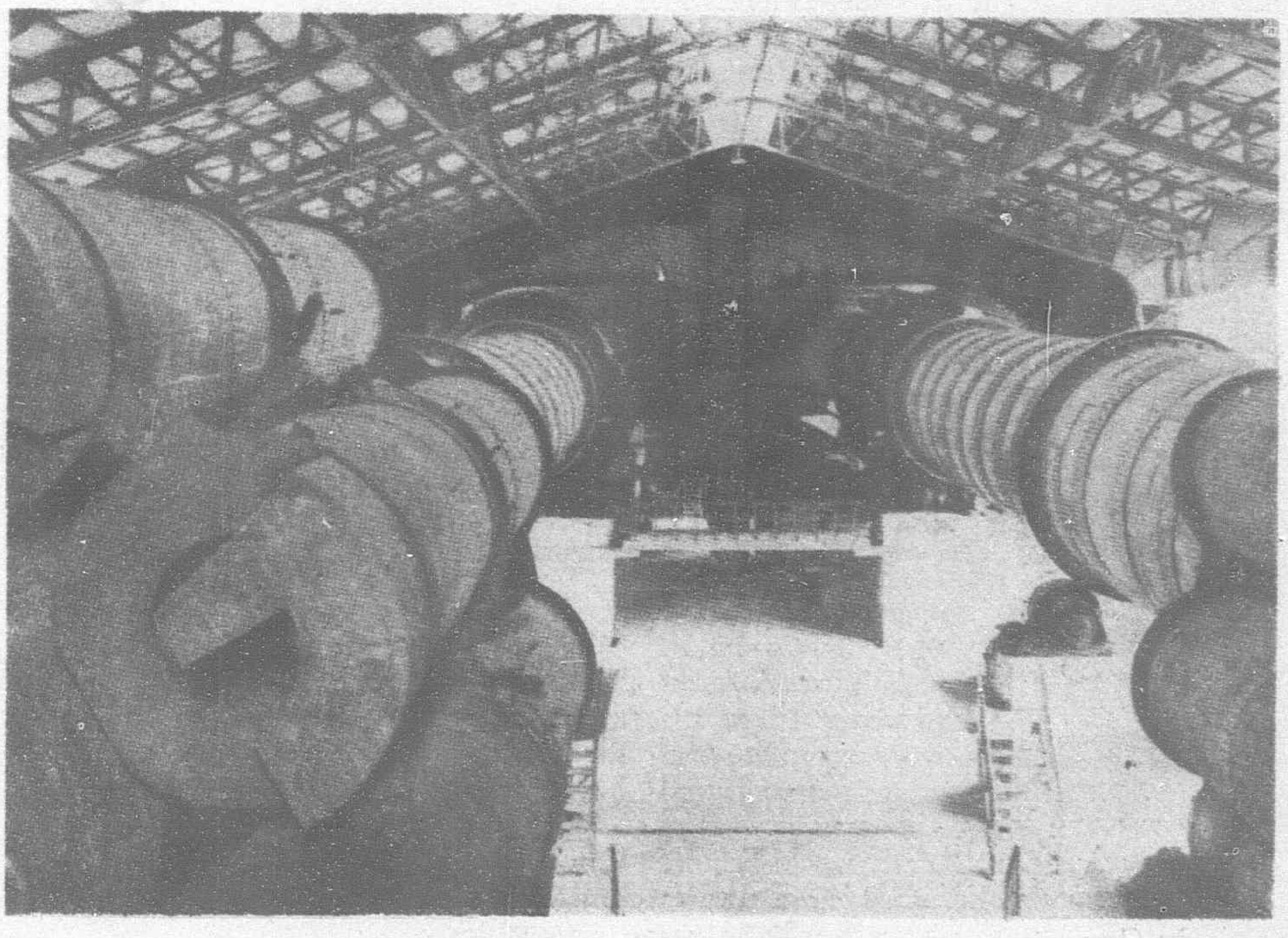
Among the newly established cement companies in Manchoukuo, those considered promising are the Manchou Cement, Daido Cement, Fushun Cement, Harbin Cement, Anshan Cement, etc.

The total amount of cement purchased by the South Manchuria Railway Company in 1934 was 174,500 tons, of which about one half was supplied by companies in Manchoukuo. In future, however, Japanese companies will have their share of Manchoukuo business, which will nevertheless be gradually reduced by the activities of the Manchoukuo companies.

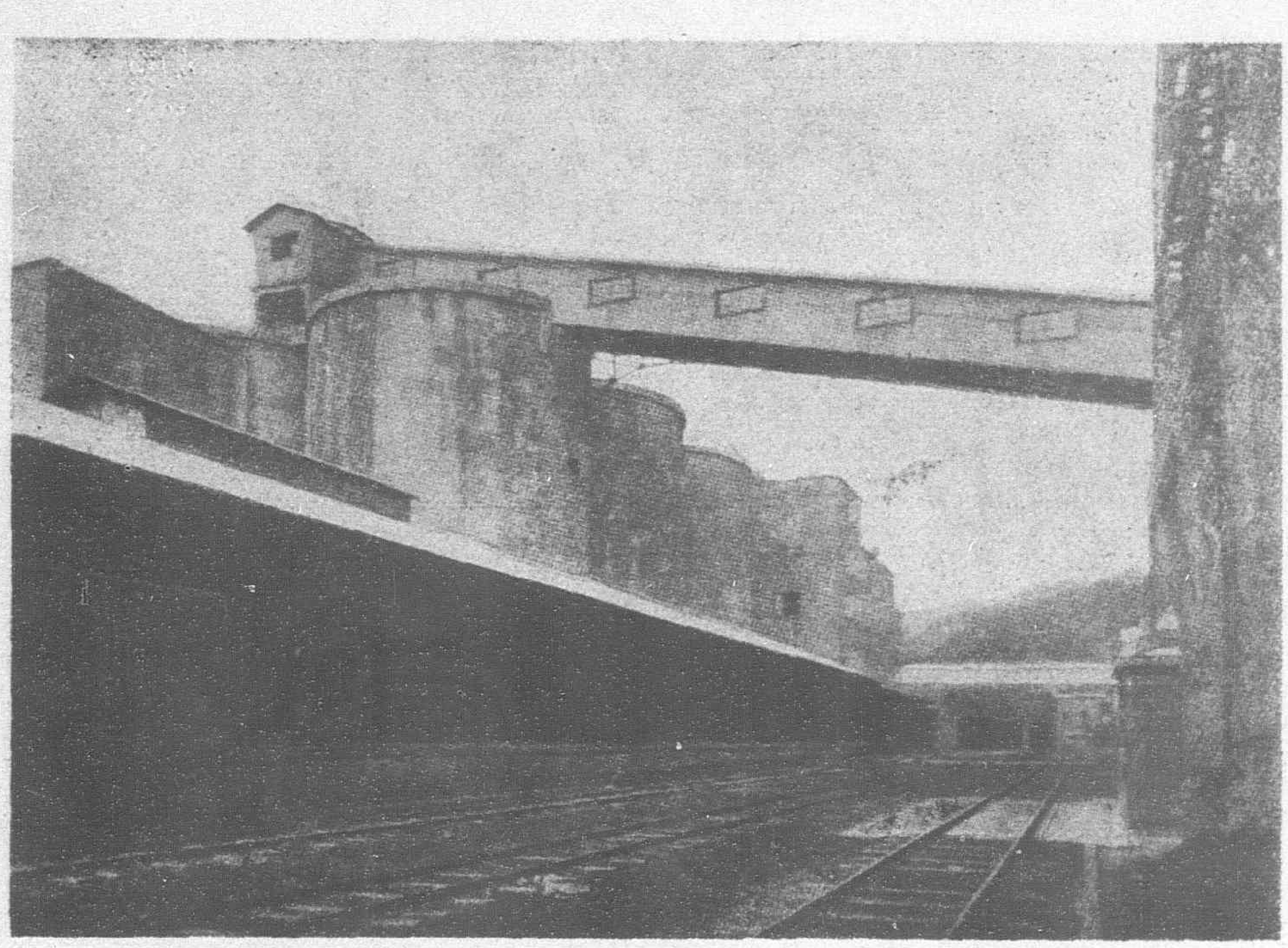
Japanese cement companies are therefore proposing that control should be extended to Manchoukuo and Chosen. The Manchoukuo market will become a serious problem for the cement industry of Japan.

EXPORTS OF CEMENT (*in metric tons*)

	1930	*1931*	*1932*	*1933*	*1934*	*1935*
Kwantung L.T. and Manchoukuo ..	8,990	5,343	27,026	109,088	230,105	112,651
China	40,372	22,054	16,722	25,720	22,653	22,358
British India and Ceylon	37,309	52,787	70,274	65,733	63,448	—
Hongkong	97,853	126,446	108,359	88,515	62,235	70,003
Straits Settlements ..	73,691	87,064	39,806	40,481	65,240	84,595
Netherlands East Indies	157,655	106,298	136,325	87,647	52,564	44,532
Philippines	45,017	15,893	13,322	3,851	2,023	1,018



Rotary kiln of Kawara Factory



Cement Silo

	1930	1931	1932	1933	1934	1935
Africa	4,042	10,514	12,660	21,271	9,998	—
Other Countries ..	23,845	19,289	21,074	31,940	31,639	—
Total	488,774	445,688	445,568	474,246	539,905	655,084
Total value (in Y.1,000) ..	10,066	9,089	8,545	7,395	8,038	8,082

Cost of Cement Production

Because of its extensive scale cement manufacture requires a large amount of fixed capital. Investigations of the leading cement companies reveal the fact that the ratio of fixed to total assets comes to approximately 70 per cent, and due to the frequency of improvements and the adoption of new and up-to-date machinery, depreciation charges constitute an important factor in production cost. Both raw materials and the finished product involve large transportation costs due to the bulky nature of cement, with the result that the location of factories has an important bearing upon the cost of production and competitive capacity.

The principal raw materials are clay and limestone, subsidiary materials comprising silica, iron sediment and gypsum, all of which account for the greater part of the cost of production, followed by fuel, mainly coal. There are two methods of manufacture, namely, the dry system and wet system, most cement factories in Japan adopting the former method. In both cases materials, burning, finishing and packing require large-scale mechanical equipment, manual labor being of less account and required only in the operation of machinery, management, etc. ; consequently wages do not absorb a large percentage of the cost.

According to official statistics the ratio of raw materials, fuel and wages to the value of production is as follows :—

	Factors in Cement Production Costs Value of Main Cost Factors (Y.1,000)				*Ratio to Total Value of Production (%)*		
	Production (Y.1,000)	*Raw Materials*	*Fuel*	*Wages*	*Raw Materials*	*Fuel*	*Wages*
1929	.. 97,185	43,403	5,598	7,476	44.7	5.8	7.7
1930	.. 55,572	15,839	6,205	5,084	28.5	11.2	9.1
1931	.. 61,246	13,778	4,058	4,760	22.5	6.6	7.8
1932	.. 67,845	11,263	3,692	4,260	16.6	5.4	6.3
1933	.. 82,019	18,023	7,549	4,652	22.0	9.2	5.7

Attempts to reduce the cost of production naturally brought about the modernization of factory equipment which in turn helped to accelerate the rationalization of the industry, thereby bringing about a sudden expansion in production capacity and a gradual decrease in the number of workers, with a resultant yearly increase in per capita output, the average production per worker having risen from Y.7,020 per annum in 1930 to Y.11,516 in 1933.

Control Over Cement Industry in Japan

The Cement Manufacturers' Association and the Japan Cement Export Association are the two leading organizations in Japan for the control of the cement industry, the former serving as the main controlling organ for production and sale, whereas the latter maintains a control over exports. Until a few influential cement companies, such as the Onoda and Oita companies withdrew, in November, 1934, the Cement Manufacturers' Association was the only powerful organ exercising control over production and sale in Japan Proper and dependencies. Even at present the control of production and sale is being carried out under a uniform system throughout the country, chiefly by the Association, since the manufacturers who are not members of the Association are subject to the stipulations of the cartel agreement by the application of the Major Industries Control Law.

At the start the Cement Manufacturers' Association enforced a minimum price convention in addition to limiting the volume of market supplies, but abandoned same later as futile, with the result that sales were left practically uncontrolled. Owing to keen competition the associated companies were led to divide the home market in November, 1930, into seven districts, to which was added Manchoukuo in December, 1932. In each of these districts a cement sales office was established to control sales on the basis of a ratio to be determined according to the production capacity and deliveries in the past, with an agreement as to standard price. A central organ was established in June, 1931, in order to supervise the sales control office and to maintain liaison among them, whereby the evils arising from competition were eliminated and the market price restored to a fair basis. Upon the new Cement Manufacturers' Association being formed in December, 1934, the sales control offices were transferred to the Association, which has thus come to assume control over both production and sales.

As regards exports, the Cement Export Association to the Netherlands East Indies was organized in 1933, in connection with the enforcement of import quotas by that colony. Furthermore, the Japan Cement Export Association was formed in December of the same year by the member companies of the Cement Manufacturers' Association with the purpose of controlling exportation to different parts of the world. This association still exists as a separate organization even after the formation of the new Cement Manufacturers' Association.

Asano Portland Cement Co. is Pioneer in the Far East

Possessing eight factories whose monthly combined capacity amounts to 250,000 tons, the Asano Portland Cement Co., Ltd., with a history dating back to as far as 1871, is the largest cement manufacturing concern in the Far East. In fact, the Asano Portland Cement Co. has not only been the foremost leader in home markets ever since its foundation, but has also been ranking as the pioneer in the export business, and as a result of incessant endeavors it has now very extensive markets including Africa on one side and South America on the other, to say nothing of the nearby markets in the Orient where " Asano " Cement is the most popular brand and looked upon as the standard by which others are measured.

The activity of its export trade may well be seen from the following table showing Asano's exports in recent years as compared with the respective totals for Japan, viz :—

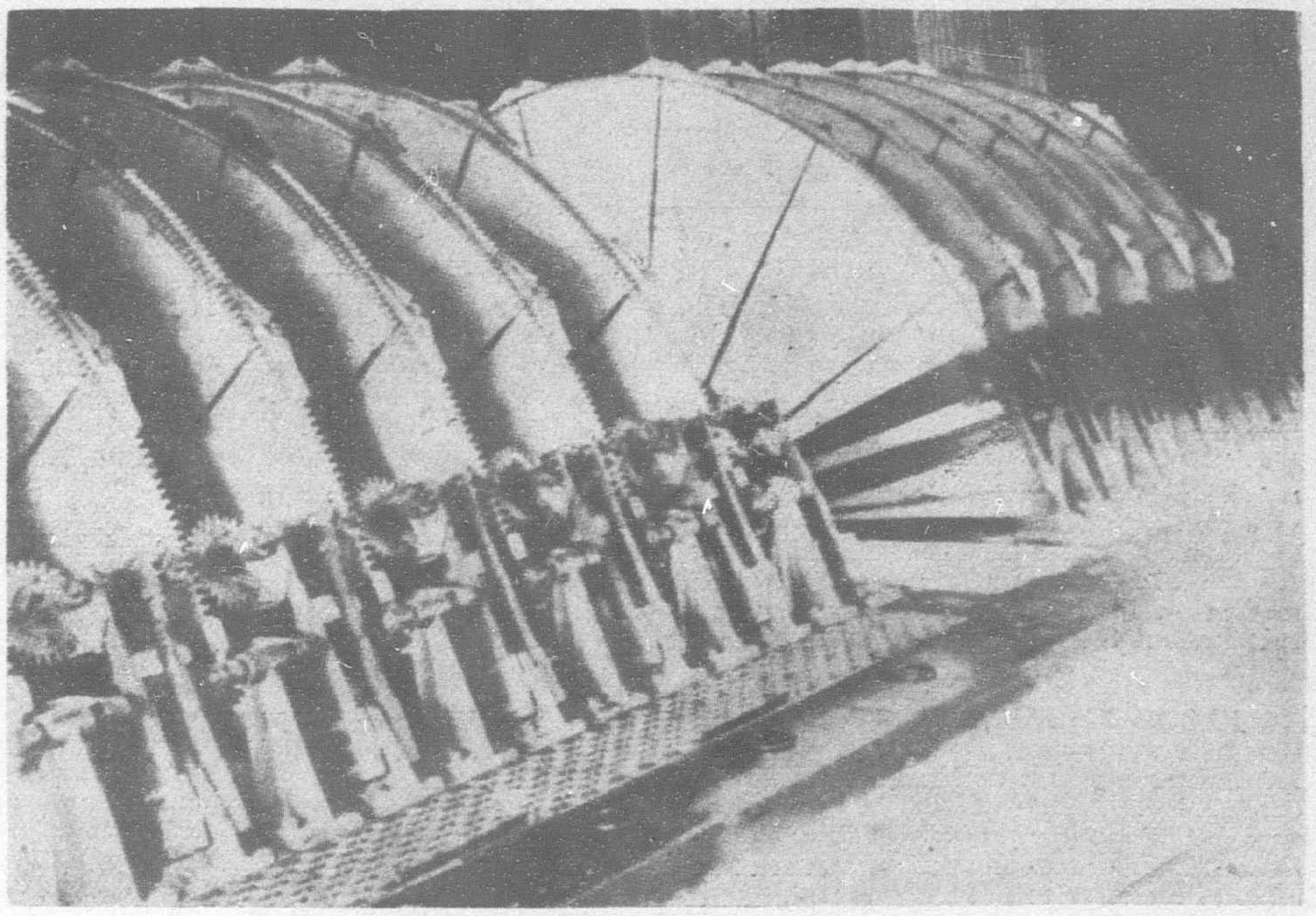
Year	*Japan Total (tons)*	*Asano (tons)*	%
1930	589,646	266,200	45
1931	520,113	179,216	34
1932	441,010	172,889	39
1933	389,506	138,944	36
1934	330,069	104,441	32

The above figures do not include the quantities exported to Manchoukuo amounting from 400,000 to 650,000 tons annually, of which " Asano " Cement occupies an important portion.

" Asano " Implies Quality

The application of rotary kilns and the invention of rapid hardening cement are undoubtedly the most important changes in the history of Portland Cement. Apart from having installed the first rotary kilns in Japan as for back as 1902, the Asano Portland Cement Co. enjoys credit for having erected the first complete wet-process factory for manufacturing a genuine rapid hardening cement which is being marketed by the name of "Asano-Velo" Cement. It may thus be observed as being only natural that "Asano" Cement is being looked upon as being of the most reliable quality on account of the Asano Portland Cement Co. having always led others, like in productive capacity, in improving the quality of cement.

"Asano" Cement is yearly supplied in large quantities to the Governments of Japan, the Dutch East Indies, Philippine Islands and other public works in Singapore, Colombo, Shanghai, and Hongkong, etc., which fact in itself bespeaks of the high quality of "Asano" Cement in that the cement supplied to these public works is always subject to strict tests in accordance with the standard specifications of the respective countries. It may be noted that a letter from Messrs. Henry Faija & Co., a well-known cement testing house in England, indicates that "Asano" Cement complies very easily with the requirements of the British standard specification.


Slutty filters

As briefly mentioned in connection with the quality of "Asano" Cement the Company built in 1929 a wet-process factory at Nishi-Tama near Tokyo for manufacturing a genuine rapid hardening cement which is being sold as "Asano-Velo" Cement, which was indeed the very first factory of its kind in Japan.

"Asano-Velo" Cement came fortunately just in time to meet the growing demand for high early strength cement of this type, and its demand has since increased to such an extent that the Company has built three additional plants of the same model at Hokkaido, Osaka and Kahara, making the total productive capacity come up to 75,000 tons a month. The fact that the demand for the new product has grown more than three times within a short period well suffices to indicate its economic value to the building and construction industry.

Some of the so-called rapid hardening cements now on the market frequently show a tendency that the high strength evolved in the early stage of hardening declines as time goes on. In brief they fail to retain the high strength permanently. Asano Portland Cement Co. has been carrying on long-period tests on "Asano-Velo" Cement ever since it was first manufactured, and the results of these tests clearly indicate that it keeps on steadily increasing in strength.

Low-Heat Cement

In recent years numerous gigantic concrete structures have come to be built, of which the most conspicuous are gravity dams like the Boulder Dam and the Pine Canyon Dam in America. However, in building such structures the heat evolved from cement during the process of its hardening often causes serious damage due to the effects upon the volume of concrete masses.

Low-Heat Cement has therefore come to be used quite recently for the purpose of minimizing the risk of damages by controlling the ultimate volume changes. As alert as ever, Asano Portland Cement Co. has recently commenced manufacturing a low-heat cement in order to meet the special demand, and is selling the product under the trade-name of "Asano Mascon" Cement, the outstanding characteristics of which make it especially suitable for the construction of gravity dams, thick fort walls, buttresses of retaining walls, bridge piers, foundations of machinery, etc.

SOVIET HEAVY INDUSTRY IN 1936

(Continued from page 451)

tons of benzine yearly; five pipe-stills with a capacity of 6.2 million tons of petroleum yearly; 1,621 new oil wells, several oil manufacturing plants for producing carbon black, paraffin, etc.; two blast furnaces with a volume of 2,073 cu.m. and an annual capacity of 810 thousand tons of pig iron; nine open-hearth furnaces with a capacity of 1,031 thousand tons of steel yearly; eight rolling mills with a capacity of about two million tons of rolled metal yearly; six coke batteries, several fire-brick works, etc.

Of the new engineering works put into operation in 1936 mention may be made of the following.

(1) Dzerzhinski rolling stock works in the Urals—first quarter section of the works with an output of 15-20 thousand railway cars yearly, a large-casting foundry and axle-car shop.

(2) Novocherkassk locomotive works with a capacity of 150 powerful engines yearly.

(3) Izhevsk and Podolsk motor-cycle factories.

(4) Several machine tool works and shops for the production of 3,700 machine tools and automatic machines yearly.

(5) Several large shops manufacturing tubings for the Moscow Underground, and so on.

Apart from the new enterprises started in 1936, the business of extending and remodelling the existing plants was also pushed forward. For example:

The Voroshilovograd locomotive works has been extended to produce 900, instead of the previous 600, locomotives yearly.

The Kolomna works, extended to produce 20 thousand extra h.p. of Diesel engines.

Considerable extensions have been carried out on the automobile works in Moscow (Stalin Works) which is to produce 20 thousand more large passenger cars, the Gorki works—70 thousand extra cars, and on the motor assembling works *KIM* in Moscow, which is to turn out 20 thousand extra cars.

The bicycle works in Moscow and Kharkov have been enlarged more than twofold; the capacity of the Moscow works is now 240,000 bicycles yearly and that of the Kharkov works 180,000.

Another transformer works with an output of transformers totalling 700 thousand kw. has been built in Moscow.

Considerable extensions as a result of new capital investments have also been made to the Urals and Kramatorsk heavy engineering works, the ball-bearing works, the "Russian Diesel" works, the Yaroslavl rubber-asbestos industrial group, cement factories, etc.

The cost of production has been reduced on the aggregate by 6.1 per cent in enterprises under the People's Commissariat for Heavy Industry.

An important factor in heavy industry is that of raising labor productivity, which registered an increase in 1936 of 26.1 per cent.

Engineering Notes

INDUSTRIAL

MITSUI AEROPLANES.—An aeroplane manufacturing company, with an initial capital of Y.30,000,000, is to be established by the Mitsui and other influential interests in Japan, where the industry is still in its infancy. It is said that experts from Vickers-Armstrong will be engaged and that the chief object will be to make army planes. The factory will be built near Tokyo.

DEVELOPMENT OF HAINAN.—The Government of Kwangtung, says the *China Times*, has decided to call for a capital of $100,000,000 for the development of the island of Hainan, off the south coast of Kwangtung. A group of leading Chinese bankers and business men, representing interests in Canton, Hongkong, and Shanghai, was expected to pay a visit to the island about the middle of April.

FLOOD PREVENTION.—A sum of $7,000,000 will be expended in China for water conservancy during the fiscal year, July 1, 1937-June 30, 1938, according to a decision reached by the National Water Conservancy Commission. A sum of $586,170 is included for the improvement of the upper and lower reaches of the Yellow River and at the request of the Yellow River Conservancy Commission, a sum of $650,000 is included for readjustment of the river bed at Tungwachai.

HUANG HO CONSERVANCY.—The Sino-Netherlands Commission for the administration of the Netherlands Boxer Indemnity Refund in connection with the conservancy of the Yellow River, met for the sixth time and approved reports submitted by various engineers on the work carried out under the aegis of the Commission. The budgetary estimates of the Commission and the Engineering Office in charge of the construction of the sewage system at the Capital were also approved.

BIG PULP COMPANY.—Establishment of a large-scale pulp manufacturing company is planned by the Manchoukuo Government, in co-operation with the South Manchuria Railway Company and Oriental Development Company, according to the *Nikkan Kogyo*. Recent investigation on the Small Khingan Ranges revealed an extensive area covered by timber affording good material for pulp. A factory will be built at Chiamusu or Tangyuan, on construction of a railway, at the cost of Y.10,000,000. The factory will have an annual capacity of 50,000 or 60,000 metric tons.

DEVELOPMENT OF MANCHOUKUO.—Manchoukuo's Five-year plan to exploit the natural resources and increase the production of the country has been completed. The capital, Y.1,500,000,000, is to be raised by the South Manchuria Railway Company, by Japanese capitalists, and by formation of a financing organization. The plan, which is divided into the categories of heavy industry; agriculture, livestock and forestry; and communications, river improvement and civil engineering. Success is, however, considered doubtful, as Japanese capitalists are against making further large investments in Manchoukuo.

SHANGHAI CUSTOMS.—Plans have been drawn for a two-storey building on the foreshore at Shanghai, to accommodate arriving and departing passengers. The scheme, if approved by the Municipal Council, would entail the erection by the P.W.D. of a $200,000 structure on ground which is now under water. The reception hall would connect directly with the baggage examination shed. Besides waiting-rooms it would contain an information department and tea-room. The structure, about 220 feet long and 50 feet wide, would have to await the sinking of piling and would not be completed until late next year.

ELECTRICAL

ELECTRICITY IN MALAYA.—Kemaman is shortly to have an electric plant installed to supply the whole town with electricity. The contract has been given to Mr. Phua Ah Heng, J.P., contractor, Kuantan. It is anticipated that the plant will be working towards the end of the year.

POWER CONFERENCE.—At a meeting of the International Executive Council of the World Power Conference, held in Paris on June 29, under the chairmanship of Sir Harold Hartley, C.B.E., F.R.S., and at which 21 National Committees were represented, a proposal from the Japanese National Committee that the fourth Plenary Meeting of the World Power Conference should be held in Tokyo in 1942 was considered.

ELECTRICITY IN CHINA.—The output of electricity in China in 1936 reached 1,740,000,000 kw.h., an increase of 11 per cent over the preceding year. There were then 456 power stations with a combined capacity of 585,424 kw. This total is now being augmented by 120,000 kw. Ten are foreign owned and represent 47 per cent of the total plant capacity of the country, 58 per cent of the annual power production and 62 per cent of the aggregate sum invested in the electricity supply industry.

B.T.H. TURBO-ALTERNATOR.—The British Thomson-Houston Co., Ltd., has in course of manufacture for the Hongkong Electric Co., a turbo-alternator rated 15,000 kw. C.M.R., running at 3,000 r.p.m. The turbine is a 23-stage single-cylinder machine, designed for operating with steam at 400 lb. per sq. inch gauge pressure, superheated to 750 deg. F., and for exhausting into a condenser maintaining a vacuum of 27.6" when the circulating water is at a temperature of 86 deg. F. The turbine is arranged for steam extraction for feed heating and evaporating purposes, the final feed temperature being 190 deg. F. at 15,000 kw.

"GRID" FOR MANCHOUKUO.—Manchuria Electrical Industry Company is carrying out a five-year program providing for 15 new power plants and a nation-wide grid for distribution at a total cost of Y.85,006,000. It is assumed that in five years Manchoukuo will require current to light 2,625,000 lamps, and have a power demand of 893,547,000 kilowatts. Work on nine of the fifteen new power plants started in 1935. These are located in Hsinking, Harbin, Tsitsihar, Taonan, Jehol, Heilungkiang, Hailar, Chengte and Chiifengkow. In the current year, three more will be built at Hsinking, Tsitsihar and Antung. In 1938 the new plants in Dairen and Hsian will be put into operation, and the central power unit in Western Manchoukuo will come into being in 1939, with sub-stations at Port Arthur, Mukden, Anshan, Hsinking, Hsian, Harbin, Dairen and Yingkow.

ELECTRICAL EXPANSION.—Construction of hydro-electric plants capable of generating 570,000 kilowatts by 1943 and subsequent exploitation of water power along the Tone River to the volume of 800,000 kilowatts have been planned by the Tokyo Electric Light Company. Tokyo Light is now building a 170,000-kilowatt station on the Shinano River, the largest river in Japan. Half of this gigantic enterprise is expected to be completed in 1939 and the other half in 1941. A 26,000-kilowatt power station on the Ono River is under construction and is expected to be finished late this year. A 13,000 kilowatt power station at Shimoyama, on the Fuji River, will be started shortly. It is to be completed next year. Construction of a 94,000 kilowatt power station at Akimoto will start immediately the project is approved. The company expects work to be finished in two years. The company is applying to the Communications Ministry for permission to lower the surface of Lake Inawashiro by 7-ft. 5-in. In this process the company proposes to construct new reservoirs to generate 10,000 kilowatts more. A 160,000-kilowatt station is in project for construction at Nosawa, on the Tadami River. Two tunnels, each three miles long, will be excavated. The work will require five years. Construction will start as soon as the project is approved. A 100,000 kilowatt station on the upper reaches of the Oi River will be one of the most difficult of engineering works. The project is expected to be completed in 1942.

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